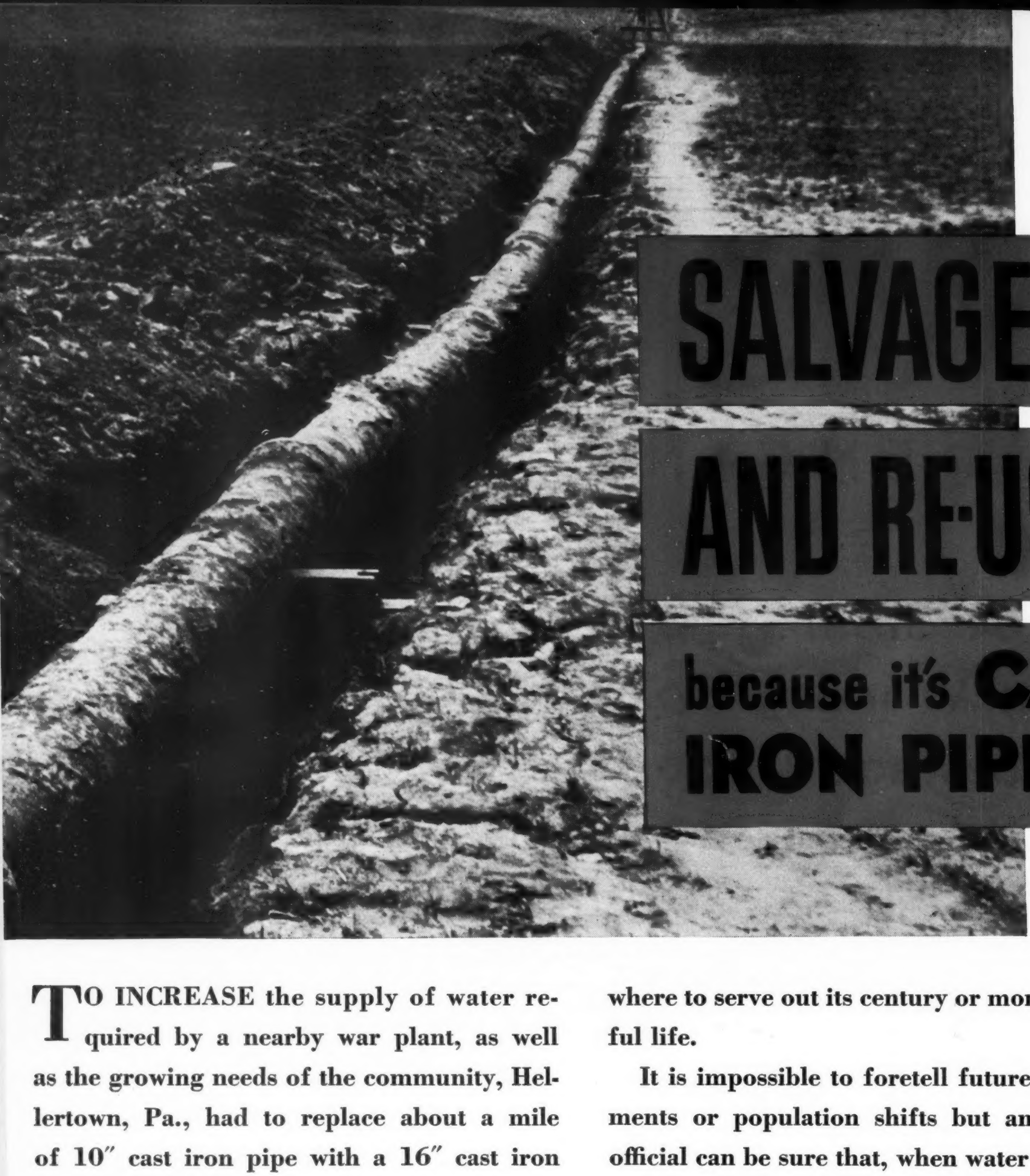
NOVEMBER, 1942

PUBLIC WORKS

ENGINEERING



SALVAGED AND RE-USED because it's CAST IRON PIPE ...

TO INCREASE the supply of water required by a nearby war plant, as well as the growing needs of the community, Hellertown, Pa., had to replace about a mile of 10″ cast iron pipe with a 16″ cast iron line. The old line, after 44 years of satisfactory service, was found to be sound and serviceable, and was re-laid elsewhere to serve out its century or more of useful life.

It is impossible to foretell future requirements or population shifts but any public official can be sure that, when water or sewer mains must be abandoned, re-routed or enlarged, the pipe can be salvaged or re-used, if it is cast iron pipe.

Pipe bearing this mark is cast iron pipe

TRADE MARK REG.

Available in diameters from 1¼ to 84 inches.

CAST IRON PIPE RESEARCH ASSOCIATION, THOMAS F. WOLFE, RESEARCH ENGINEER, 1015 PEOPLES GAS BUILDING, CHICAGO, ILLINOIS

CAST IRON PIPE

PUBLIC TAX SAVER NO. 1

THE WAR EMERGENCY

Latest Method of Applying for Preference Ratings for Additions

Recent changes made by the War Production Board necessitate a restatement of the requirements for making application for preference ratings and authority for construction of additions to property and equipment. Information required: Job number for the proposed construction. Description of project or equipment and of the proposed additions (size of pipe, pump, etc., location of hydrants, valves, etc.). Statement of relationship to military needs, war production, public health or safety. Copy of project or equipment preference rating order. Can service be rendered in any other way using smaller quantities of critical materials? Estimate of total cost. List of materials required, with weight of each, to be entered on Sec. D of revised Form PD-200.

Where additions are not extensions of service, add to the above statement of population to be served and relation to existing construction. Urgency of need, including estimates of existing capacities and requirements for the next three years. If interconnections with neighboring systems are possible, state extent to which you can utilize each other's capacities. The latest practicable date for putting the project into operation.

First secure priorities assistance for the project by filing Form PD-200 revised as of August 1, 1942. Also state in application to what extent materials needed can be purchased from excess stock of other utilities.

For further details, obtain from War Production Board, Washington, D. C., their Administrative Letter No. 7.

P-46 as Amended to October 22

This allows new high ratings for water works—AA5 for routine purchase of repair materials and AA2X for emergency purchases. But inventories, as well as use, of repair and maintenance materials must be reduced.

Under this head the American Water Works Association, on October 22, gave the following information:

First—There are no new or additional restrictions placed upon the stores and use of material needed to keep up production equipment and structures. This means that wells, supply lines, pumps, filters, chlorinators—everything that it takes to put water into the mains—can be kept in as first-class order for service as was the recorded practice in 1940. The 1940 recorded use of materials as well as inventory thereof has been considered by the Power Branch to be a fair yardstick to measure the normal needs of the field.

If system output has increased, paragraphs (f), (4), (i) and (ii) authorize proportionate increases in purchase of maintenance materials for *production* and *pumping* facilities.

But second—distribution maintenance *stores* and *use* must be cut 40% below 1940 levels. There are many good reasons for this. They cannot be discussed here but simply must be accepted in loyal American spirit.

Third—only 60% of this can be bought from manufacturers. The rest must be obtained from surplus stocks of other water plants. This includes pipe, valves, specials, hydrants, meters, etc. The inventory records on meters must be kept separate from the other distribution materials records. The purchase of meters must be considered by itself and held to the 60% level of inventory as well as the further 60% purchase limitation—altogether apart from the other distribution materials. Paragraph (f), (4), (iii) allows the purchase of meters needed to serve the net increase in customers in any quarter year. It means this—suppose that a plant, in 1940, had a distribution repair inventory of $5,000. Now only $3,000 worth of similar material can be kept in stores. $2,000 worth must be set aside as surplus, for sale or trade with other water works that need it. When the allowable inventory total gets below $3,000, purchases can be made from manufacturers *up to $1,800 worth only*. The $1,200 worth balance must be bought or borrowed from the neighboring water works, or from a plant's own surplus if it contains the items that are needed. Remember these figures are used only as an example. Apply them to your own plant and own figures. When it comes to using from the *distribution* stock pile, where **$100** worth was used before, only $60 worth can be used now. Some things simply cannot be done. Stick to essentials and let the frills wait.

Mutual aid must go to work now. Every water works man in every state must work with—and for his own state water coordinator (or whatever he is called). Give him your surplus inventory list and buckle down to make things work and service go on. After six months or so, the surplus will all be used up—and the critical shortage of metals eased up. Right now our task is to work and share with our neighbor water works and keep water flowing!

Two important interpretations have just been received:—

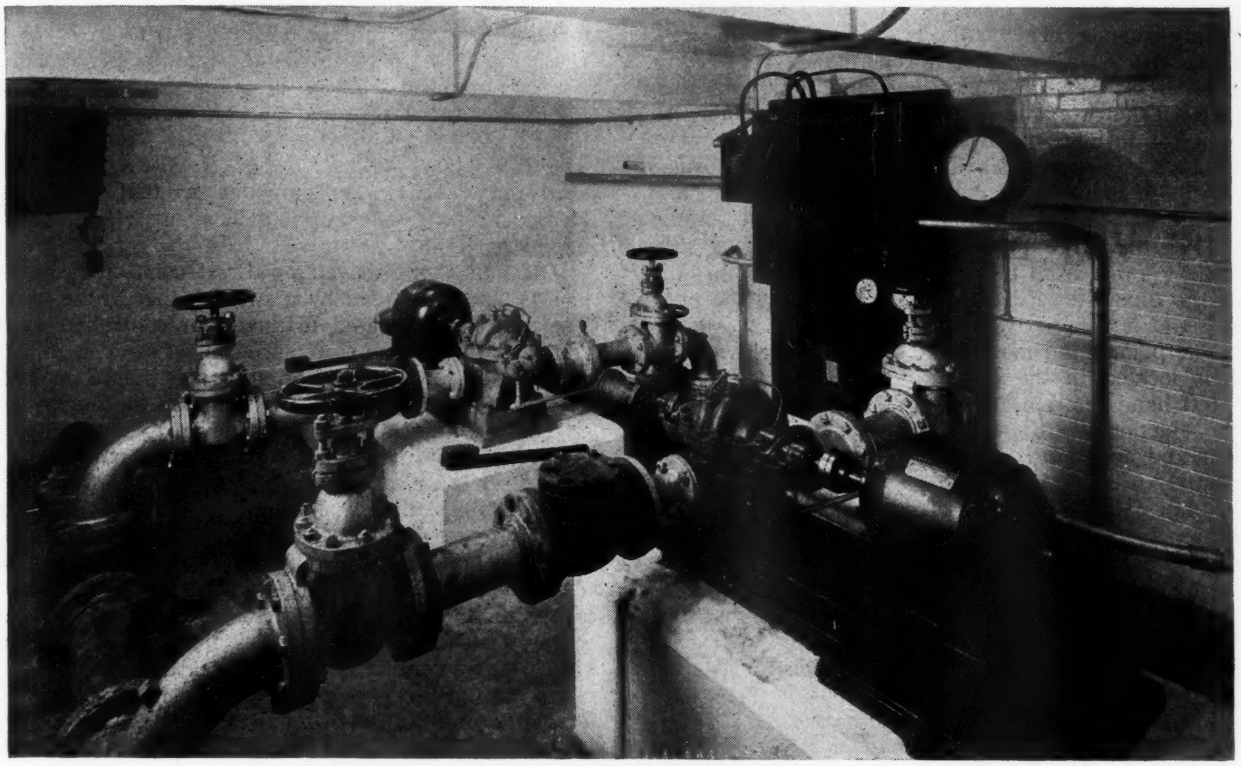
(1) Pending orders for maintenance and repair material may be re-rated at levels conferred by the new P-46—if the customer executes *Re-rating Certificate* (Form PD-4Y). Re-rating can be applied to an order *only* so far as the revised inventory/use restrictions of P-46 affect the right of the customer to order materials for delivery from a manufacturer. It may be preferable for a customer to file a new order.

(2) Projects of the P-200, P-19, P-545 categories are not re-ratable under the terms of the new P-46 Order and materials held in stores for any such projects (incomplete) are not to be taken into account in computing the dollar value of the maintenance and repair inventory. If/when a special project is complete, any materials remaining on hand become subject to the inventory restrictions of P-46.

(Continued on page 53)

PUBLIC WORKS ENGINEERING . . . NOVEMBER, 1942

VOL. 73. NO. 11



Interior of underground automatic booster station at Muscatine.

An Underground Automatic Continuous Booster Pumping Station

By WALTER MOLIS

Superintendent of Water Distribution, Muscatine City Water Works

Located in a residential section, it was placed underground and surrounded by shrubbery. One or both pumps automatically thrown in or out of service, as required by consumption, including fires.

WITHIN the City of Muscatine, Iowa there is a residential area known as "Fair Oaks Addition" located on a hill on the eastern side of the city. Due to its high elevation with respect to the main reservoir supplying the distribution system, the water pressure in the mains was low, varying between 28 and 36 lbs. per sq. in. This condition brought many complaints from consumers, as second stories of many homes had insufficient pressure to supply second floor outlets. This area has a population of 455 divided among 130 residences. Within it is located one of the city parks which contains a swimming and wading pool that consume considerable water in the summer time.

As the area has become a very desirable residential section, the need for increasing the water pressure became apparent because of the necessity for adequate fire protection as well as of increasing domestic requirements.

A booster pumping station was concluded to be the most feasible solution, and a plan was devised so that

the area could be isolated by gate valves from the balance of the city distribution system. By means of booster pumps, pumping continuously into the mains of the isolated area, the pressure could be raised to the desired amount.

In order not to detract from the residential architecture in the vicinity, the pumps were placed underground in a reinforced concrete vault, whose inside dimensions are 12 feet by 18 feet, with a 3′ 6″ by 3′ 6″ area on one side for an entrance stairway. The vault has 6′ 8″ of head room from floor surface to ceiling surface. The walls are 12″ overall in thickness, with 6″ of reinforced concrete on the outside, a 4″ brick wall on the inside, and a 2″ air space between the two. The roof has 1½″ of cork imbedded in it for insulation purposes. Ventilation is provided by four 4″ vent pipes located at the four corners. Drainage is provided by an automatic sump pump which pumps the water from a collecting sump through a 1½″ discharge pipe to the ground surface some 50 feet away from the vault. The outlet of this discharge pipe is located in a hedge bordering the property and is hidden from view.

The pumps and motors are set on concrete foundations located in the center of the floor. One pump is left hand rotation and the other is right hand rotation. Suction and discharge piping are just above the floor and are painted with aluminum paint, to which ground cork has been added to prevent sweating of the pipes in the summer. The cork in the roof and the air space in the walls prevent sweating also. An electric unit type heater is mounted on a bracket in one corner and gives sufficient heat to maintain 55° temperature in the vault when the air temperature is 0° outside.

Shrubbery planted around the outside of the roof slab practically obscures the flat roof surface from view and presents a pleasing landscape effect.

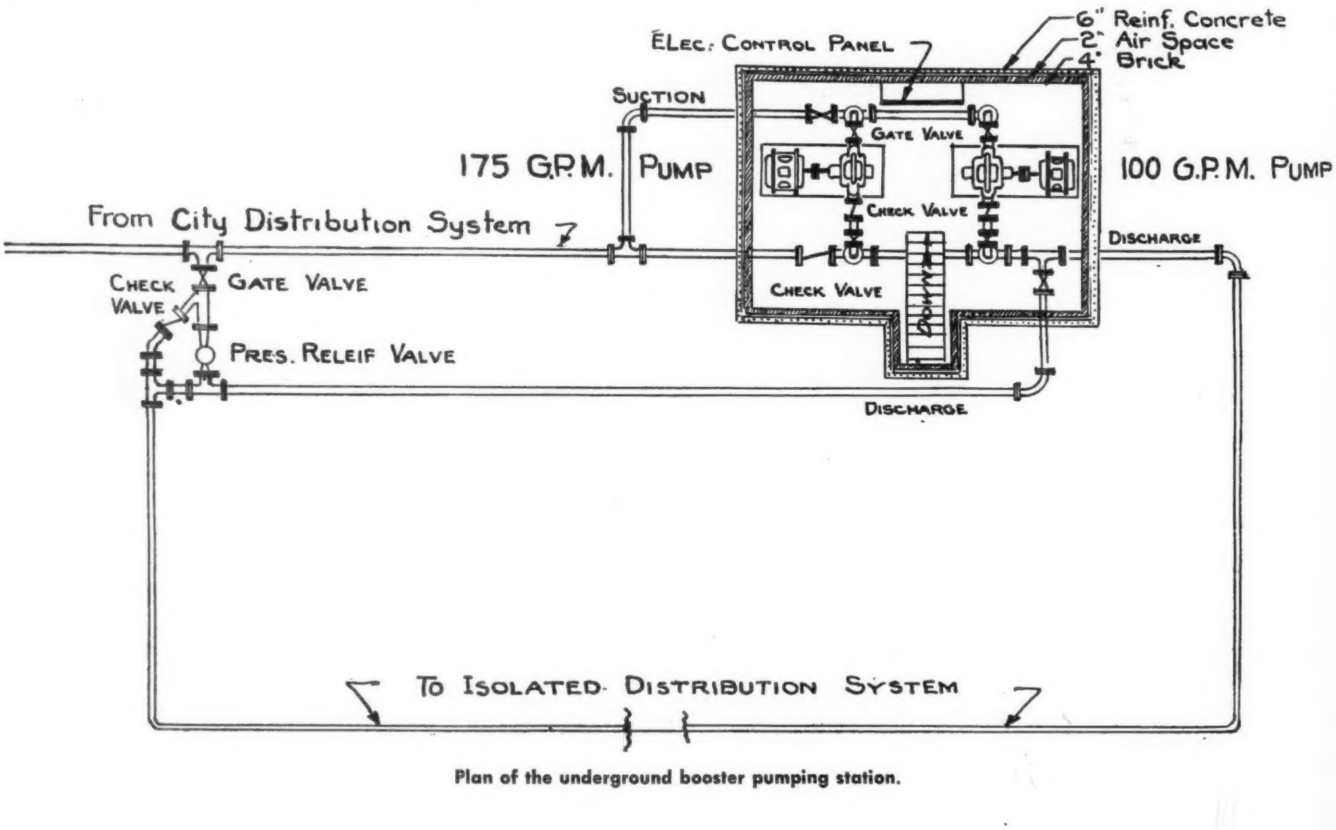
In considering the capacity of the pumps to be used, an analysis of the area was made to determine the existing average and peak demands, and to intelligently estimate future peak demands and fire requirements. This study revealed the month of July to be the peak month of water consumption, the park swimming and wading pool contributing heavily towards the peak demand of the day. It was estimated that the peak demand to be provided for would approximate 200 g.p.m., and the average demand 80 g.p.m. The fire requirements could be quite satisfactorily met with a 200 g.p.m. output, which would give a 40 lb. nozzle pressure on 100 feet of 2½″ hose. Additional fire requirements above this could be augmented by booster pumps on the fire trucks.

Examination of centrifugal pump performance curves led to the selection of a 100 g.p.m. and a 150 g.p.m. pump, whose rated outputs were at the maximum efficiency point with an 80-foot pumping head. The 150 g.p.m. pump is designed with a 175 g.p.m. shell but a 150 g.p.m. impeller, so that future increased capacity can be obtained by merely changing impellers.

The pumps are driven by direct connected electric motors, and controlled by a switch panel in the vault. They may be operated manually or controlled automatically by means of pressure control switches, which can be set for starting or stopping pumps at predetermined pressures in the system. As the pumps are set near the distribution system level, the suction side is under a positive head and is thus permanently primed—a condition ideal for automatic operation.

The 100 g.p.m. unit is connected to the control panel so as to operate continuously day and night, and for normal demands it will maintain a 58 lb. pressure in the system. When an abnormal load or peak demand is put on the system, the pressure will fall off and when it has dropped to 45 lbs. the pressure control switch makes contact and automatically starts the 150 g.p.m. unit. With both pumps operating, the pressure is again brought up to approximately the 58 lb. range. When the abnormal load falls off, the two pumps will build up an excess pressure, and when this reaches

(Continued on page 24)



Plan of the underground booster pumping station.

Quartz Creek bridge on Wolf Creek highway. Regarded as one of the finest in the west.

Wolf Creek and Wilson River Highways, Oregon

Two routes through rugged mountain country reduce by nearly fifty per cent the highway distance from Portland to the coast.

PORTLAND, Oregon, on the Columbia River, is about 60 miles from the coast as the crow flies, but the distance by highway has been about double that until the recent construction of the Wilson River and Wolf Creek highways. These roads are only 65% completed, but connect with old established ones and provide shorter and fast routes to the coast. Also, penetrating heavily wooded mountain country, they provide access to about twelve billion board feet of timber.

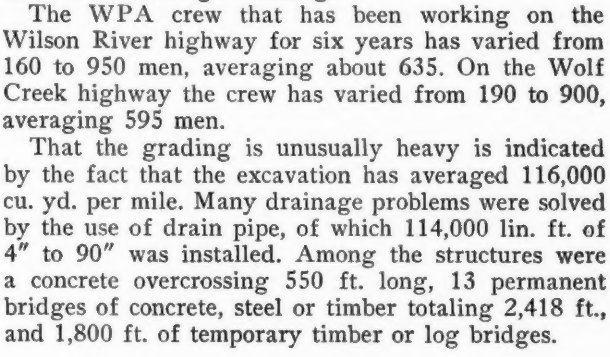
The eastern 14 miles of the two roads coincide, and is now under construction, traffic of both roads meantime using an alternate route. From the branching point, 7½ miles of the Wolf Creek road and 12.7 of the Wilson River road are unfinished, but the former is under construction.

On the constructed portions of both highways the maximum grade is 6%. The maximum curvature is 6° on the Wolf Creek and 10° on the Wilson River highway, but temporarily slightly sharper curvature exists on each at certain points due to emergency conditions such as detours around slides and a proposed tunnel. Original plans for the Wilson River highway called for construction of three tunnels but as work progressed it was decided to change two of these to open cuts, one of which involved 200,000 cu. yd. of excavation, the other 350,000 cu. yd.

Much of the work was at considerable distances from population centers and daily transportation of labor between their homes and the project sites was impracticable, and work camps therefore were necessary. These included barracks, mess halls, kitchens, recreation rooms, infirmary, power and pump houses and various storage buildings.

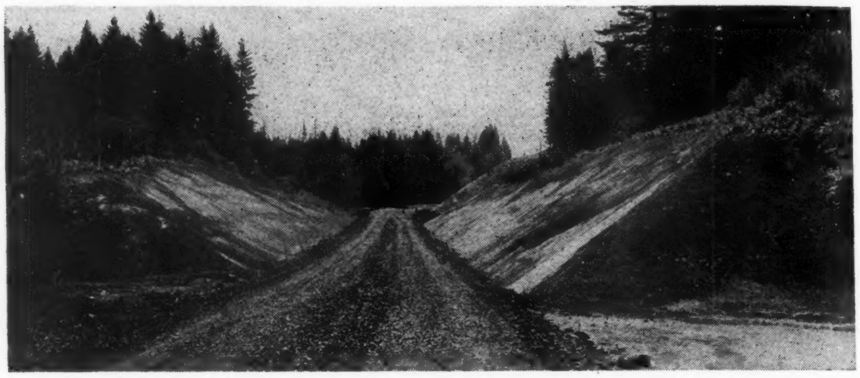
The WPA crew that has been working on the Wilson River highway for six years has varied from 160 to 950 men, averaging about 635. On the Wolf Creek highway the crew has varied from 190 to 900, averaging 595 men.

That the grading is unusually heavy is indicated by the fact that the excavation has averaged 116,000 cu. yd. per mile. Many drainage problems were solved by the use of drain pipe, of which 114,000 lin. ft. of 4" to 90" was installed. Among the structures were a concrete overcrossing 550 ft. long, 13 permanent bridges of concrete, steel or timber totaling 2,418 ft., and 1,800 ft. of temporary timber or log bridges.



Types of heavy equipment used on Wolf Creek highway.

Camp Manning and the Wolf Creek highway.



Wolf Creek highway showing slopes and base rock on roadway.

Material from rock excavations was used for the base course of the roadbed, in addition to which 335,400 cu. yd. of pit-run or quarry-run rock was used for surfacing. Twelve quarries were operated to furnish rock for 695,000 cu. yd. of crushed rock surfacing. In addition, approximately 12,400 cu. yd. of riprap and rubble masonry were placed for slope and roadbed protection. The 79.5 completed mileage of the Wolf Creek highway has an 18" course of rock topping and surfacing. This is covered with a non-skid surface requiring 6,930 tons of bituminous material.

An 800-ft. tunnel 40 ft. wide by 23 ft. high was constructed, lined with treated timber and having portals faced with rubble masonry. Slide control was a major problem; many slides were stopped or prevented by tunneling and tapping the subterranean flow of water at slip seams, or by digging open ditches, some as deep as 35 ft., and laying perforated pipe in them backfilled with rock and cordwood.

Approximately 650 tons of explosives were used in blasting rock excavation, 200 tons for blasting stumps and 250 tons for blasting quarry rock.

Modern equipment was used throughout the work, including power shovels from ⅜ to 1½ cu. yd.; trucks from 3 to 5 cu. yd.; crawler tractors from 60 to 120 hp.; scrapers from 10 to 13 cu. yd.; bulldozers for 60 to 95 hp. tractors; angle-dozers for 60 to 95 hp. tractors; 10-ton trailers; 25-passenger buses; 12 cu. yd. Linn trucks; 30 cu. yd. LeTourneau buggies; compressors; jackhammers; water pumps; logging drums; logging donkeys; pull grader; motor grader; ripper; 10-ton rollers; rock crushing plants with capacities from 25 to 100 cu. yd. per hr.; 1,000-gal. water wagons; spreader boxes; electric welders.

In spite of the difficult and dangerous working conditions, only five pieces of equipment—a tractor and four trucks—were damaged beyond repair, and few men were injured seriously, although many landslides occurred, some as great as 20,000 to 30,000 cu. yd.

To date the expenditures for the Wolf Creek highway have amounted to $7,403,631, and for the Wilson River highway to $6,045,801, of which about 70% was for WPA projects and the rest for private contract work. The costs have been shared by the Oregon State Highway Commission, the City of Portland, the counties of Clatsop, Tillemook, Columbia, Washington and Multnomah, the WPA and the Public Roads Administration.

Eventually a four-lane super-roadway is planned as a part of the Wolf Creek highway from the Multnomah County line to North Plains, a distance of 14 miles, and right-of-way of sufficient width for this is being purchased. A two-lane highway is now under construction in such a way that it later can be doubled in size. Over-crossings are scheduled to be constructed between Portland and North Plains, so that roads which cross will go over or under in order that they may be free of cross traffic. It will probably be several years before these over-crossings are built.

The Oregon Highway Commission has acquired the ownership of several hundred acres along each side of both highways through the logged-off, burnt-over and timbered sections. When funds and men are available, it is planned to clean up some of these tracts, plant trees and build some roadside parks.

Operating Sewage Treatment Plants in Westchester County

In the article under this title in our October issue the statement was made that Lubriplate "is applied to all the equipment about once a year." This of course was a mistake; it should have read "about once a week."

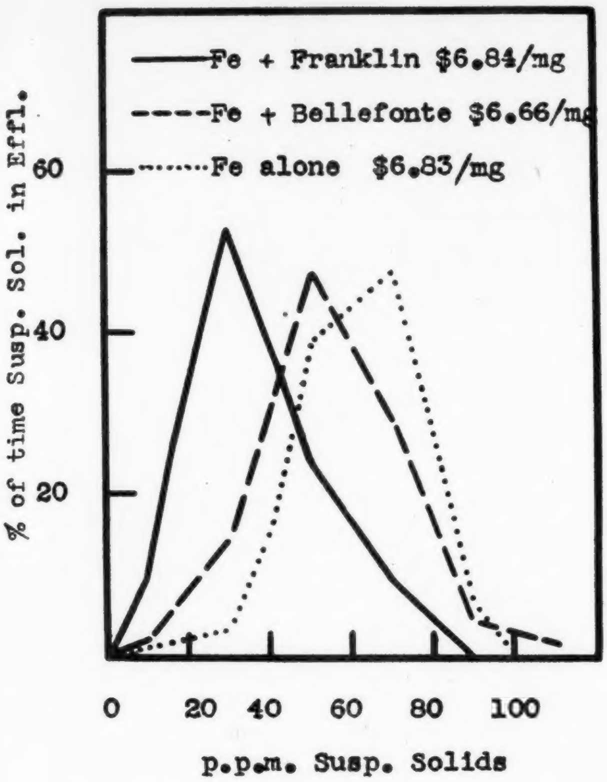


Fig. 1—Percentage of time various coagulants produced excellent, fair, poor and very poor results.

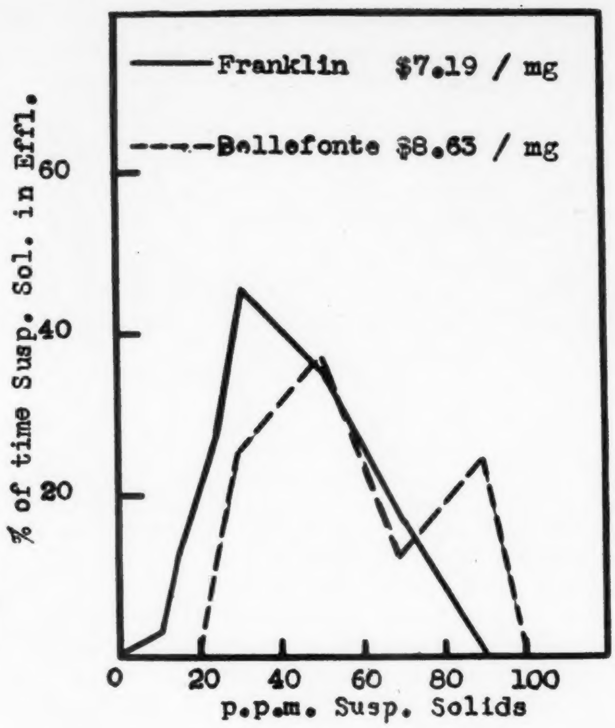


Fig. 2—Percentage of time when lime alone produced various results.

Effect of Lime in Coagulation of Sewage

By WILLEM RUDOLFS
Chief, Dept. Water and Sewage Research, New Brunswick, N. J.

Comparisons, made in two treatment plants, of the effectiveness and costs of three commercial high calcium hydrates with little difference in their chemical ingredients.

THE importance of lime in chemical treatment of sewage, especially in conjunction with coagulants such as iron and aluminum salts, is not always realized. The lime serves to reduce the quantities of more expensive chemicals, neutralizes acidity, adjusts the pH values of sewage to the optimum range for coagulation, acts as a coagulant, affects the grease present and changes the viscosity of the liquor.

An extensive study in the laboratory and on a plant scale with various types of hydrated limes, quicklimes and limestones regarding the possible relationships between various properties, particularly structure of particles, their size, solubility, flowing characteristics, electrical charges, and their role in floc formation and settling, indicated that the type of lime or the manner of preparation has a considerable effect on the rate and degree of clarification of sewage.*

Sewage and water plant operators have noticed that limes with practically the same chemical composition may behave entirely differently. Such observations may be based upon the coagulating effect of the lime or their behavior in handling and feeding.

The results reported in this paper are in the nature of an illustration and deal only with a part of the work performed on a plant scale. It is limited to the comparison of three commercial high calcium hydrates used in water and sewage treatment.

*Rudolfs and Moggio, Ind. Eng. Chem. (In press.)

Limes Used

The hydrated limes used originated from different limestone deposits and were obtained in the open market. A partial chemical analyses of the limes is shown in Table I. They are designated by the names of the deposits, namely, Franklin, Farnam and Bellefonte. It will be noted that the difference in chemical ingredients is very slight and on this basis the different limes should be equally effective.

TABLE I

Partial Chemical Analyses of Hydrated Limes

	Franklin %	*York* %	*Bellefonte* %
SiO_2	0.25	0.22	0.60
Fe_2O_3 and Al_2O_3	0.36	0.16	1.14
CaO	72.53	72.63	72.84
MgO	1.92	1.62	0.94
CO_2	0.24	0.23	0.52
$CaCO_3$	0.54	0.52	1.27
$Ca(OH)_2$	95.44	95.59	94.88

Treatment Plants

The plant experiments were made at the New Brunswick, N. J., and Raritan, N. J., sewage treatment plants.

New Brunswick.—This plant has a typical chemical coagulation layout, consisting essentially of screens, dosing devices, flocculators, clarifiers, digesters and vacuum filter equipment. At the time of experimentation the daily flow was approximately 5 mgd. The sewage was relatively weak, containing considerable industrial wastes. Normal operation involved coagulation by ferric sulfate (ferrisul) with no pH adjustment, settling, digestion and dewatering.

Raritan.—This disposal plant treated about 750,000 gallons of sewage daily, containing about 25 per cent industrial wastes which consisted largely of dye and soap wastes. Normal operation involved coagulation with ferric chloride, pH adjustment with lime, flocculation, settling and filtering through sand beds built in the clarifiers. The fresh solids were dewatered on vacuum filters and incinerated.

Results

For comparative purposes, the results obtained are presented separately for the two plants.

*New Brunswick.**—Following local practice, the chemicals were fed by dry feed machines into solution boxes and thence discharged into the sewage. The lime was added at the center portion of the diversion chamber to the flocculators and the ferrisul at the rapid mixer. Samples were taken at half-hourly intervals after the bar screen and at the effluent weirs of the clarifiers. Hourly composites from catch samples of the two clarifiers were analyzed for suspended solids and B.O.D. while the pH values were determined. Hourly flows of sewage and dosages of chemicals were recorded. The tests were run with ferrisul alone, ferrisul and lime, and lime alone. Each test was run during six or seven week days.

A summary of the operation results, given as the averages for the different periods, together with the relative cost of treatment, is shown in Table 2. The daily average suspended solids and B.O.D. in the raw sewage varied materially during the period of experimentation. The result shows that a combination of lime and ferrisul does not necessarily produce better results than ferrisul or lime alone. However, lime alone appeared to be more costly than a combination of lime and ferrisul for this particular sewage. Of particular interest is the indication that Franklin lime and ferrisul additions produced effluents with less suspended solids and lower B.O.D. than Bellefonte lime and ferrisul. The same was true when the limes were used alone. The average results do not show clearly the actual effluents produced for approximately the same cost. For this reason, the results were graded as excellent, good, fair, poor and very poor by grouping the hourly results within limits of 20 ppm. suspended solids remaining in the effluent. The percentage of times the results came within certain limits was then calculated. These calculations are graphically shown in Fig. 1 for the two different combinations of ferrisul and lime, and ferrisul alone. It can be seen that the combination of ferrisul and Franklin lime produced "good" effluents with suspended solids between 20 and 40 ppm. for 53 per cent of the total time, whereas ferrisul and Bellefonte lime produced such results only 14.5 per cent of the total time, and ferrisul alone produced "good" results only 3.5 per cent of the time. The shift from "good" to "fair" and "poor" is clearly indicated.

The results obtained with the two different types of calcium hydrate added alone were grouped in a similar manner and the percentages of time for each group calculated. The results of the calculations are graphically shown in Fig. 2. Again a shift from "good" to "fair" results is shown. In spite of the fact that the actual cost of treatment for the Bellefonte lime was about 17 per cent higher, the Franklin lime gave better results.

Raritan.†—All chemicals were added as wet feed. The lime was fed as a slurry from a well-agitated tank. Anhydrous ferric chloride was dissolved in non-corrosive tanks and added in solution form. The chemical additions were controlled in relation to the flow.

Samples of raw sewage were collected after the bar screen, effluents from the clarifiers after sedimentation and again after sand filtration. Analyses were made on hourly composites, which in the case of the effluents were made from catch samples collected at both clarifiers. Determinations made included pH, suspended solids and B.O.D. of the raw, settled and filtered sewage. Again a two-hour lag was used to make the effluent samples correspond to the raw sewage entering the plant. The hourly flow and chemical dosages were recorded.

The types of lime used in conjunction with ferric chloride were: Franklin, Farnam and Bellefonte. Each combination of chemicals was used for periods of nine to eleven working days.

The mass of data obtained has been summarized in Table 3. Hydrated lime prepared from Franklin deposits in conjunction with Fe_2Cl_3 produced an average settled and filtered effluent containing less suspended solids than hydrated lime prepared from Farnam or Bellefonte limestones used in conjunction with Fe_2Cl_3. This in spite of the fact that the average suspended

*Analytical work was done by D. Newton, Assistant.

†Analytical work done by J. Kaplowsky, Research Assistant.

TABLE II

Average Operation Results and Relative Costs at New Brunswick, N. J.

	Franklin & Ferrisul	*Bellefonte & Ferrisul*	*Franklin alone*	*Bellefonte alone*	*Ferrisul alone*
Suspended sol., raw sewage, p.p.m.	213	178	230	289	165
Suspended sol., effluent, p.p.m.	26	56	44	57	61
Reduction, %	86.1	61.6	75.8	80.1	60.2
BOD, raw, p.p.m.	230	288	188	293	208
BOD, effl., p.p.m.	138	188	128	128	121
Reduction, %	42.7	30.3	32.1	36.0	42.8
Lime, lbs./m.g.	682	693	1,382	1,658	0
Ferrisul, lbs./m.g.	249	231	0	0	516
Lime cost, $/m.g.	3.55	3.61	7.19	8.63	0
Ferrisul cost, $/m.g.	3.29	3.05	0	0	6.83
Total chemical cost, $/m.g.	6.84	6.66	7.19	8.63	6.83

Note: Lime at $10.40/ton, Ferrisul at $26.50/ton

TABLE III

Average Operation Results and Relative Costs of Chemical Treatment at Raritan, N. J.

	Franklin & Fe_2Cl_3	*Farnam & Fe_2Cl_3*	*Bellefonte & Fe_2Cl_3*
Susp. solids, raw, p.p.m.	202	189	164
Susp. solids, settled, p.p.m.	37	44	52
Reduction, %	81.6	76.8	68.4
Susp. solids, filtered, p.p.m.	25	32	40
Reduction, %	87.5	83.1	75.7
BOD, raw, p.p.m.	215	247	251
BOD, settled, p.p.m.	121	129	156
Reduction, %	48.4	47.9	36.8
BOD, filtered, p.p.m.	109	116	131
Reduction, %	54.2	51.6	47.6
Lime, lbs./m.g.	1,444	1,396	1,433
Ferric chloride, lbs./m.g.	419	387	441
Lime cost, $/m.g.	7.50	7.26	7.46
Ferric chloride cost, $/m.g.	12.59	11.80	13.25
Total chemical cost, $/m.g.	20.09	19.06	20.71

Note: Lime at $10.40/ton; Fe_2Cl_3 at $60.00/ton.

solids in the raw sewage treated was lowest when Franklin lime was used. There was no significant difference in the percentage B.O.D. reduction of the settled sewage when Farnam or Franklin lime were used, but the percentage reduction with Bellefonte lime was lower. The B.O.D. remaining in the effluent was lowest with the Franklin lime. The lime cost and total cost were somewhat lower with the Farnam lime.

To determine more definitely whether the effluents produced during the periods of experimentation were uniform, the percentages of time they were excellent, good, fair, poor and very poor were calculated. The results are shown in Table 4. It can be seen that Franklin lime and Fe_2Cl_3 produced excellent and good results in the settled effluent 60 per cent of the time, as compared with 52 and 36 per cent of the time when Farnam and Bellefonte limes were used respectively.

It was thought possible that the days of the week when the various combinations were used influenced the results, on account of the change in sewage. In this respect it should be stated that the various types of lime were used in rotation, namely, one lime and ferric chloride for three to five days, then another lime for a similar period and again another for several days. This procedure was then repeated. The average results for the different days of the week are shown in Table 5. The number of samples used for calculation were Bellefonte 82, Farnam 86, Franklin 62. It can be seen that the results obtained on settled and filtered sewage with Franklin lime and Fe_2Cl_3 were uniformly good, while the results with Farnam lime were generally slightly lower, and those obtained with Bellefonte lime and Fe_2Cl_3 inferior during the beginning of the week. These results correspond to laboratory experimentation where it was shown that one type of lime was better than another when more grease or laundry wastes were present in the sewage.

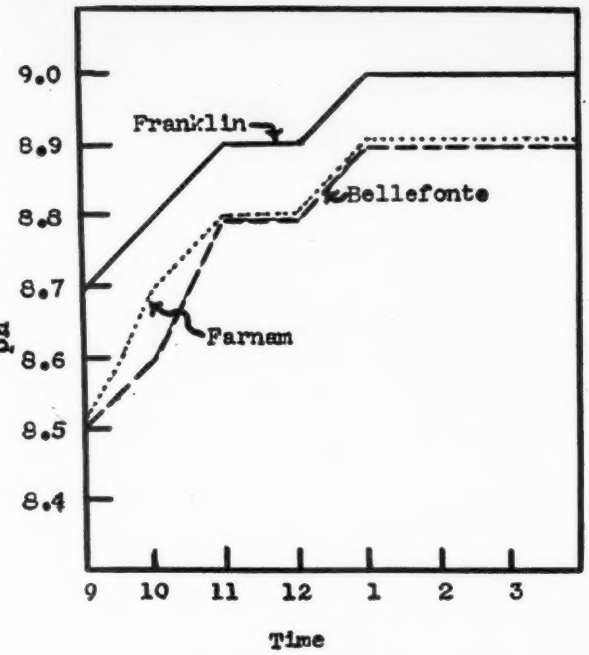


Fig. 3—Effect of lime on pH of effluent.

In coagulation of sewage, lime is used for pH adjustment. The Franklin lime produced persistently a slightly higher pH value than the other two limes. As an example, the average results of pH readings in the effluent during the day time when the sewage was strongest is illustrated in Fig. 3. It is not likely that these small differences in the pH values used for coagulation were of importance, but it may make a material difference when the amounts of lime used are insufficient to obtain optimum conditions.

Incidentally, it may be of interest to know that with good coagulation and settling, the removal of suspended solids by the sand filters varied from 3 to 12

(Continued on page 34)

TABLE IV

Percentage of Time Various Amounts of Suspended Solids Remained in Settled and Filtered Effluents

Susp. Sol. p.p.m.	*Bellefonte & Fe_2Cl_3* Settled	*Bellefonte & Fe_2Cl_3* Filtered	*Farnam & Fe_2Cl_3* Settled	*Farnam & Fe_2Cl_3* Filtered	*Franklin & Fe_2Cl_3* Settled	*Franklin & Fe_2Cl_3* Filtered
0-20	11.0	*30.5*	19.8	*41.0*	23.0	*46.8*
20-40	25.6	32.9	32.6	31.3	37.7	39.1
40-60	31.7	20.7	19.8	10.8	29.5	14.1
60-80	17.0	7.3	20.9	14.5	9.8	0
80-100	8.6	3.7	5.8	1.2	0	0
Over 100	6.1	4.9	1.2	1.2	0	0
0-40	36.6	*63.4*	52.4	*72.3*	60.7	*85.9*
0-60	68.3	84.1	72.2	83.1	90.1	100.0

TABLE V

Average Suspended Solids in Sewage and Percentage Reduction on Different Days

Day	*Franklin & Fe_2Cl_3* Raw Ppm.	*Franklin & Fe_2Cl_3* Settled %	*Franklin & Fe_2Cl_3* Filtered %	*Farnam & Fe_2Cl_3* Raw Ppm.	*Farnam & Fe_2Cl_3* Settled %	*Farnam & Fe_2Cl_3* Filtered %	*Bellefonte & Fe_2Cl_3* Raw Ppm.	*Bellefonte & Fe_2Cl_3* Settled %	*Bellefonte & Fe_2Cl_3* Filtered %
Monday	246	83.9	88.9	246	74.4	77.6	197	64.5	69.2
Wednesday	206	82.4	87.3	206	77.9	83.9	156	53.3	69.6
Thursday	175	80.2	87.2	181	76.1	81.3	169	75.0	83.0
Friday	184	84.8	89.1	194	77.0	84.3	156	74.7	82.0
Saturday	180	74.0	84.4	146	78.9	89.3	142	82.4	84.5

Measure Your Wells Now*

By WILSON M. LAIRD
State Geologist, North Dakota Geological Survey, Grand Forks

Many ground water levels are falling, giving warning of approaching failure of the supply. Well measurements will indicate if, and to what extent, this is true in a given area.

THE statement, "We never miss the water 'til the well runs dry" is an old saying which has been repeated many times to you. However, it is always applicable regardless of how trite it is. At the present time, North Dakota has had an abundance of rain for over two years with the result that everything is green and the prospect for an abundant harvest is excellent. We need think back but a few years to realize that it was not always this way. A much further backward look will show that our weather is very definitely cyclic in nature with the dry periods alternating with the wet periods.

Well Information Desired

Because of this, we, of the North Dakota Geological Survey, like to have as much information in our files concerning the municipal wells of the State for as long a period of time as possible. Some of these municipal wells have been measured periodically over a long period of time; for example, those at Harvey have been observed for 15 years. This gives us a fairly accurate picture of ground water fluctuations during the period.

There are several things which you municipal water operators can do that would be of value to you and to us. These things would require only about five minutes of your time a week. These are:

1. Measure and record accurately the water levels in your wells periodically. Do this at least once a week after the well has rested from pumping for as long a period of time as possible. This will determine fairly accurately the static water level.

2. Measure your wells before and after you pump your daily supply. This will determine your drawdown.

It is important that you begin your records now even if wartime conditions make it seem unimportant.

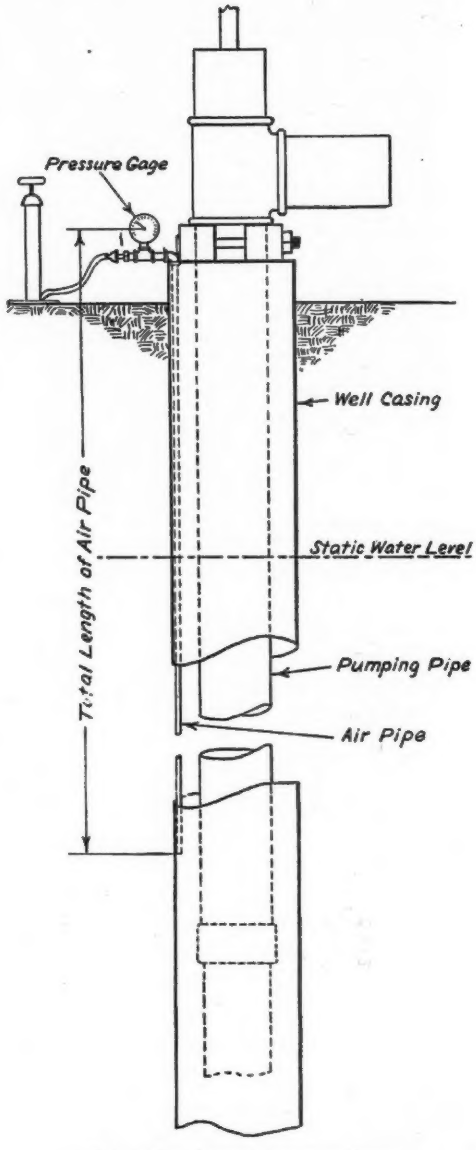
There are several things to note about the recordings mentioned above. In regard to measuring static water levels, it is best for this purpose to measure unused wells. Such wells might be those which have been drilled for test purposes but which were not developed for city supplies. Fargo has several such wells which have proved excellent for purposes of measurement. When a pumping well is used to determine water levels, we cannot always be sure that recovery from heavy pumping is complete and therefore our calculations regarding the water level may be wrong.

Drawdown Important in Studies

The determination of drawdown is easy and quite important. In this, the pumping well is measured immediately before and after pumping. This determines how much your water level recedes after each pumping. Drawdown varies with different wells. Some

(Continued on page 24)

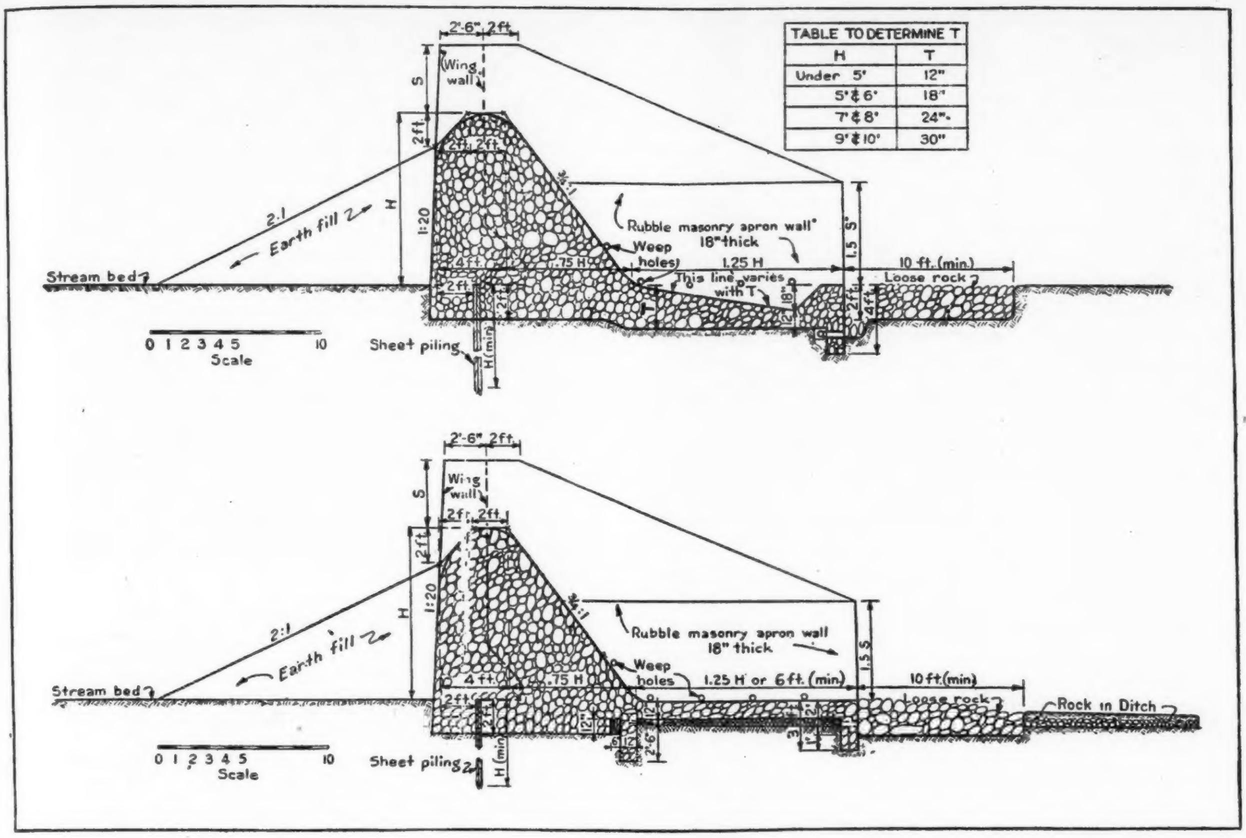
*From Johnson National Drillers Journal.



Set-up for determining drawdown.

The installation illustrated gives sufficiently accurate results if the following instructions are carefully carried out: (1)—The exact vertical distance between the center of the pressure gauge and the end of the air line must be determined. (2)—Use enough air line (either small pipe or tubing) to extend below the lowest level that the water may be reduced by pumping. Be sure the air line and connections are air tight.

To obtain readings, pump air into the air line, recording the highest reading in feet. This reading indicates the pressure of the water standing above the bottom of the line; subtracting this from the vertical distance (1) will give the distance from the gauge to the static level. To check the level after pumping has begun, pump air into and through the air line again and note the lowest reading possible to obtain. The distance between these two readings is the "drawdown" for that rate of pumping.



Figs. 10 and 11. Upper—Section of rubble masonry dam where foundation can not be drained. Lower—Section of such dam where foundation can be drained.

Fundamentals for Designing Low Dams—III

Earth Dams, Concluded

Concluding installment of this series of articles. Constructing earth dams. Designing and constructing gravity section masonry dams. Timber crib dams.

CONSTRUCTION.—Diversion of the stream to allow for the construction of the dam will usually be the first actual step in construction. An earth dam is built as a single structure, and should be carried up uniformly. Therefore, a culvert or pipe must be constructed to carry floods through the dam during construction. This culvert or pipe may be intended to carry the stream flow during construction only, or it may be planned to act as a permanent outlet. In either case, precautions already outlined for structures passing through the dam must be followed.

These precautions are necessary with any pipe extending through the embankment. Pipes or culverts that are used only during construction should be filled with concrete when no longer needed for outlets.

An intake should be constructed several hundred feet above the dam, with a ditch to convey the water to the pipe or culvert outlet. The capacity of the intake, the ditch and the outlet pipe needs careful consideration. These cannot be large enough to take care of all possible floods during construction. Probable flood damage to the work should be balanced against the cost of providing these facilities. In an earth dam, overtopping of a partially finished job is nearly always disastrous, though properly balanced earth mixtures, such as already discussed, when properly compacted, are very much less apt to suffer severe damage. For this reason, as well as for safety and satisfaction in service after completion, proper grading of the earth, control of moisture content, and thorough compaction are worth while.

Construction of the cutoff trench is next necessary. If a concrete core wall is to be used, and the cutoff trench goes to rock, the rock should be thoroughly cleaned, examined for seams, crevices, faults, etc., grouted if necessary, and the core wall tied firmly to the rock. If a core wall is to be used, but rock is not reached, excavation should be carried down to a thoroughly firm and tight formation, cores or drillings taken to assure a satisfactory depth of this stratum, and, in case of doubt, tight sheet piling driven down. This should be nearer the upper face of the core wall—preferably within a foot of it—and should be tied into the concrete.

Tight piling may also be used with a dam without a core wall, or with one having a puddle core wall; but unless carried above the water level of the reservoir—in which case it becomes a thin and flexible core wall—it may be difficult to make a good tie between the sheeting and the earth fill and therefore it is a potential source of weakness. If used, and terminated below the water line, selected material should be carefully tamped around and over it.

Procedure in making a concrete core follows usual practice for making watertight concrete. The trench should preferably be filled with concrete: the wall should be carried up somewhat ahead of the earth fill, which should be very carefully compacted alongside of and against it. Fill should be carried up on both sides of the wall uniformly.

In making a puddle core, the trench should be wide enough so that spreading and compacting of material can follow the practice adopted for the body of the dam. The trench may be 18 or 20 feet wide, with edges sloping about 45°.

The area to be covered by the dam should be cleared of all trees and brush, sod and organic matter removed, stumps and roots larger than about an inch in diameter dug out, and in swampy spots or others which are not firm, the unsatisfactory material should be entirely removed. The area to be covered by the dam should then be plowed; tractors and bulldozers are invaluable in this work. At some time before the filling of the reservoir, the shore line contour should be run and all trees and brush below this cut down and removed.

Spreading and Compacting.—The soil of which the dam is to be made should be spread in layers 6 to 10 inches thick gauged by means of dump sticks or other devices. Bulldozers are extremely efficient in spreading the fill material in layers of uniform depth, and the tractor is a material help in compacting. Stones larger than 3 or 4 inches in size—the size of one's fist—should be excluded from the fill, and may be piled to form the downstream toe of the dam, as shown in Figs. 3 and 4.

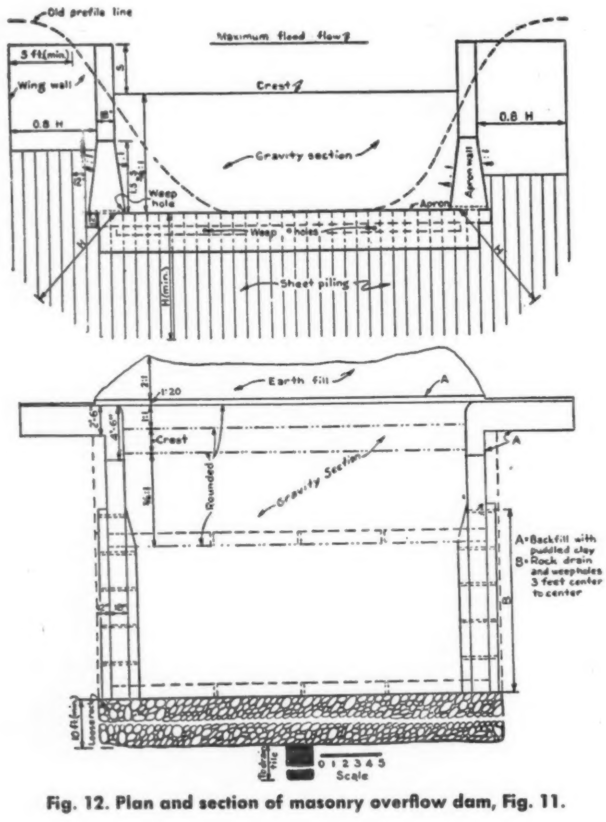


Fig. 12. Plan and section of masonry overflow dam, Fig. 11.

Any excess of larger stone may be stored for riprap on the upstream face or for paving the spillway.

The soil should be tested for moisture content as it is placed on the dam; it should, of course, have been tested for texture, grading and other necessary characteristics previously. Moisture tests from time to time will determine whether the soil layers should be allowed to dry out before compaction, or whether sprinkling is necessary to obtain the desired per cent of moisture. For adding water, a sprinkling cart or a pump and hose may be used. Water should be applied to a compacted layer before spreading a new one, rather than to one not yet rolled.

Trucks hauling dirt and tractors operating bulldozers and other equipment aid in compaction. Road rollers, concrete rollers and other devices are also used for compaction. The sheepsfoot roller is superior to any of them. Multiple grooved rollers are preferable to smooth rollers, which tend to compact the fill in laminations, since with the smooth surface obtained by them, ties between successive layers of fill are difficult to obtain, unless the surface is harrowed or dragged before the next layer of dirt is placed. This is not the case with the sheepsfoot roller.

Generally eight or ten trips of the roller and tractor are sufficient to produce the required compaction; a few days of experience will determine this for any particular job.

The faces of the dam should be built a foot or so beyond the limits shown on the plans, and afterwards trimmed to the proper lines, since compaction cannot be secured at the very edge of the bank.

Spillways have already been discussed. If possible they should be located away from the dam, in rock, or lined with reinforced concrete paving or with stone at least 12 inches deep and grouted with cement mortar.

r. Preventing Erosion. — Erosion of the face of a dam from heavy rains sometimes occurs. Prevention of this by means of a thin layer of bituminous material is possible. Highway fills in Virginia have been protected against erosion by this method.

With a properly designed spillway, even an extraordinary flood, or the breaking of a dam upstream, should not cause overtopping of the entire length of a dam by more than a few inches. This being the case, protection against failure from this cause would be practically ensured by a light surface treatment or bituminous stabilization of the crest and downstream face, though this might have to be supplemented at the downstream toe, where conditions will be most severe.

MASONRY DAMS

IN THIS article only gravity-section dams will be considered. By a gravity-section dam is meant one that utilizes the weight of the masonry to resist the forces tending to overturn or otherwise displace or destroy it. Rubble masonry dams are generally similar in design to concrete dams, and most of the material here will apply also to them.

a. *Site Requirements; Foundations.* — A masonry dam needs a firm foundation and suitable side banks into which to tie the ends of the dam. The spillway may form a part of the dam section; therefore, the same problem does not exist in this regard as with an earth dam. A good rock foundation is desirable; but a low dam can be built on firm earth, in which case excavation should be carried down to an impervious stratum having ample bearing power to support the dam. If such a stratum is not available, another site for the dam should be found.

b. *Preparation of Foundations.*—In the case of rock foundation, excavation should be carried down to the rock, and all porous, broken or infirm material removed. The rock should then be cleaned thoroughly, preferably with wire brushes. The dam should be keyed to the rock, and precautions taken to obtain a good bond between the concrete and the rock.

Where, in the case of a low dam, it is necessary to place the dam on an earth foundation, excavation should be carried down to a stratum that, by test pits, has been shown to be firm enough and deep enough to sustain the load. A trench should be dug, upstream from the center of the dam, and sheet piling driven in it to a depth equal to the height of the dam. The method of construction is shown in Figs. 10 and 11. Where piling cannot be driven, a trench should be excavated to depth at least 2/3 the height of the dam and a concrete core or cut-off wall constructed.

A masonry dam should not be built on a porous stratum nor on earth that becomes plastic when wet. Every effort should be made to retain water behind the dam and to lessen the amount of water under the dam.

c. *Wing Walls.*—Wing walls are often used to join the dam to the side banks of the stream. They should be carefully constructed to prevent seepage of water around the ends of the dam. A wing-wall design should require percolating water to travel as far or farther to get around or beneath the ends of the dam as to pass under the dam. Where rock is present in the stream banks, the dam can be tied to this throughout.

d. *Forces Acting on Masonry Dams.* — The forces acting on a dam include pressure from the water in the reservoir; uplift, due to water under the dam; silt pressure from silt deposits behind the dam; ice pressure; and sometimes earthquakes. In low dams, silt pressure and earthquakes can be neglected; and ice pressure also, except in very cold climates.

The water pressure for a non-overflow dam is $\frac{1}{2}\ wh^2$ or $32.25\ h^2$, where h is the maximum height of water behind the dam. This pressure is applied at a point $\frac{2}{3}$ of the depth from the water surface at its maximum height to the base of the dam. The water pressure on a 1-ft. section of a dam 15 ft. high to the level of the spillway, with 1 foot of flow over the spillway, will be $32.25 \times 16^2 = 8256$ pounds, and this force acts at a point 10.67 feet below the surface.

Uplift pressure is due to the water which, under pressure from the reservoir, travels slowly through the rock or soil under the dam, exerting a pressure in all directions. In design, this pressure is considered to act vertically upward. For a concrete dam on a foundation of moderately porous rock, uplift pressure may be assumed at 0.67 wh per square foot of base; and for a concrete dam on an earth foundation, wh per sq. ft.

The weight of the dam, to which should be added (1) the weight of the water overflowing it, if any, and (2) the weight of the water vertically above any part of the dam (as where the upstream face is battered), resists the overturning moment of the water behind the dam. From the weight of the dam should be deducted the uplift pressure.

The friction between the dam and the material on which it rests resists the tendency for the dam to slide. The friction value of the foundation material and the weight of the dam less the uplift, determine the resistance to sliding.

Masonry dams should be so designed that the resultant of all the forces acting, including weight of dam, always falls within the middle third of the dam. This provides an ample safety factor against overturning.

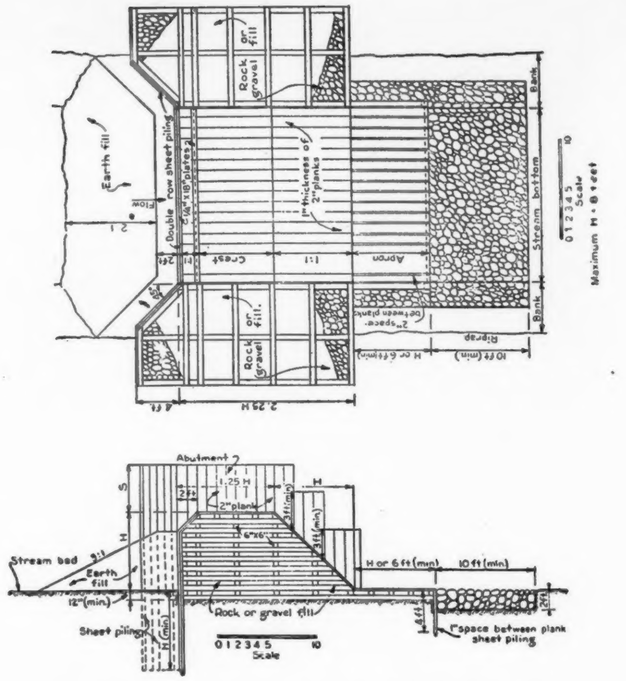


Fig. 13. Plan and section of rock-fill timber crib dam.

e. *Types of Masonry Dams.*—Dams may be of the overflow or the non-overflow type. In the former, overflow occurs over all or a considerable part of the dam. In the latter, the spillway may be located elsewhere (as in the case of earth dams), or an overflow section may occupy a relatively small proportion of the length of the dam.

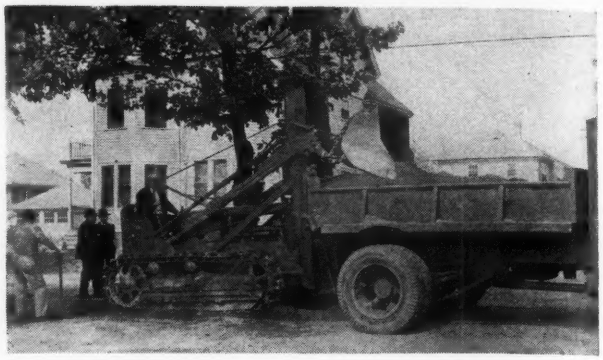
Two types of masonry overflow dams recommended for use in North Dakota are shown in Figures 10 and 11. The principal difference in the two designs is in the method of draining the downstream apron. The apron of the section shown in Figure 10 is drained at the downstream toe and must be heavy enough to resist uplift pressure. The apron thickness for various heights of dams is shown in Figure 10. This type of dam should be used for earth foundations where topography, soil and stream flow are such that it is not likely the soil beneath the downstream apron can be drained during the winter months.

The section shown in Figure 11 should be used for locations where it is probable that the stream bed will drain during the winter months. Drains laid as shown in Figure 11 should be provided beneath the downstream apron to dry out the foundation during the winter and thus prevent the apron heaving from frost action. The water from the tile lines drains into the riprap below the downstream apron. A trench should be extended downstream for a sufficient distance to drain the riprap during the winter months.

The design of the spillway, wing wall, and sheet piling is practically the same for both sections. The lip of the spillway has been sloped in front and designed with a large section to resist ice pressure. The spillway should be slightly curved at the crest and at the base to conform approximately with the natural curve of the water. It is not considered practicable, due to construction difficulties, to round the spillway to conform exactly to the shape of the nappe.

(Continued on page 34)

Spraying tar and dumping aggregate.



High-lift shovel loading truck from sewer trench.

View of Cranston's gravel screening plant.

Preparing pre-mix. Both shovels are about to mix the treated aggregate in a pile containing 60 cu. yd. of aggregate and 1,000 gal. of Tarmac.

Restoring Streets After Sewer Construction

By ELTON F. DURFEE
Commissioner of Public Works, Cranston, R. I.

Elton F. Durfee

Trenches settled, excavated six inches by means of a power shovel, and filled wth a base course and tar pre-mixed surfacing material.

IN THE year 1939 the City of Cranston started the installation of a complete sewer system. The construction of this necessitated ripping up the greater part of the city's streets, for house connections as well as sewer mains; and the completion of construction left these streets in a deplorable condition. However, a program for restoring them was initiated shortly after the construction was well under way, the procedure of which is described below.

The trenches as left by the sewer construction were backfilled with the excavated material and well puddled. In most cases they were crowned above the grade of the street. The width of the trenches at the surface varied from 5 to 15 ft., according to the way the sides caved.

We purchased an International Tractor T-35, upon which we installed a Hough high-lift shovel. This tractor was just about the width of the excavation and operated similar to a bulldozer. With this tractor we levelled off the trench and excavated it to a depth of six inches below the original grade. The excess dirt was picked up by the high-lift shovel and put into trucks, by which it was taken to the city dump. Then a crew of men cut down the edges of the trench and adjusted the manholes to the proper grade.

The City of Cranston owned a gravel bank and a crusher-screening plant. The gravel from this bank, which was about 50% sand and 50% stone, was sent to the crusher plant and screened. All material under one inch was sent back to the bank for the stock pile, and the larger size stones were left at the plant in stock piles to be used as base.

High-lift shovel excavating ditch for resurfacing.

The base stone was spread over the trench backfill to a depth of 4 inches and filled with the sand screenings, and this was packed down with a 3-wheel roller or a 10-ton tandem.

At the gravel bank we prepared a pre-mixed surfacing material (described below), with which the trench was filled up to grade, being spread and raked by hand. It was then rolled and the road immediately opened to traffic. Any later settlement of the trench was adjusted by further use of this mixed material. We found that this material will stick to the original pavement if only ½ inch thick.

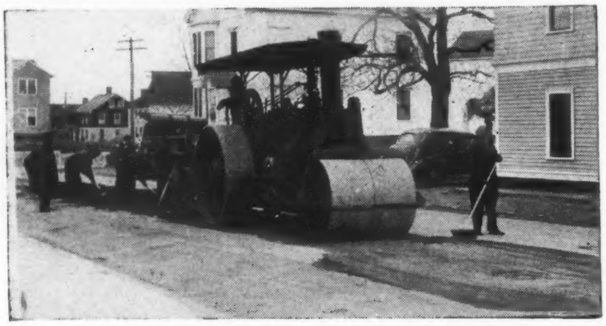
At the end of the year we again applied the same mixture on the streets, filling in the settlements, levelled off the high spots and brought the road to the proper grade.

It was then ready for the seal coating, which consisted of ¼ gallon of binder covered with sand. To spread the sand we used a rotary "Chip-It-Over" sand spreader (made by the Burch Corporation). The surface was then thoroughly honed and given another coating of ¼ gallon of either M.C. No. 3, R.C. No. 3, or tar. (We experimented with the different types of bituminous material.) The final treatment was a coating of tar or asphalt covered with sand, which was extended over the full width of the road.

On main highways where there is heavy traffic or where the original construction was penetration or the higher type of pavement, the final coating of asphalt was covered with ½ inch trap rock and then thoroughly rolled.

After the first winter there are signs of the roads having been disturbed by the sewer construction, and the riding qualities seem to be excellent.

The larger percentage of the work was done as a part of the W.P.A. program. All labor was furnished by the Federal Government, and all equipment furnished by the city. Therefore, we have no records of the actual cost, other than the material and equipment.



Resurfacing crew placing pre-mix over trench.

The mixed material referred to above was developed by the writer about nine years ago and the patent for it assigned to the Koppers Co. It is known locally as "Durfee Mix," and is prepared as follows: Gravel from ¾ in. to fine sand is used, a good mix consisting of 30% stone, 62% sand, and 8% soil or loam passing the 200 mesh ("dirty" gravel is better than clean). Sixty cubic yards of this is mixed with 1,000 gal. of tar of a special grade having a viscosity of 50 to 80, varying with atmospheric temperature and moisture content of the aggregate.

In mixing, the power shovel dumps two full buckets of sand in a cone-shaped pile and tar is sprayed over this, using a 30 ft. length of 1-in. pipe at the end of which are three spraying nozzles. This gives a pile with alternate thin layers of sand tar; the tar being absorbed by the sand both above and below it.

After a pile has been built up in this way it is mixed, the shovel taking material from the bottom and placing it in back of the pile, which is continued until all the material is of a uniform jet black color. It is then placed in a stock pile for future use. It will not harden in the pile, and we usually mix 30,000 to 40,000 gallons in the fall and use it for patching during the winter months. One shovel will mix and stock 180 cu. yd. a day.

Underground Automatic Continuous Booster Pumping Station

(Continued from page 12)

61 lbs., the pressure control switch cuts out, and the 150 g.p.m. pump is automatically stopped, while the 100 g.p.m. pump continues to operate and carry the normal load

As a precaution against possible failure of the automatic control equipment and the resulting building up of excess pressures, a pressure relief valve has been installed which is adjusted to open at 65 lbs. pressure and by-pass its flow into a 12" main of the city distribution system. Precaution has been taken against power failure and no pump operation, by installing spring-operated check valves in the distribution main ahead of the pumps. Should the pumps cease operating, gravity pressure from the city distribution system will open the check valves and supply the area by gravity flow.

This improvement was about seven weeks under construction and completed in July, 1941 at a total cost of $3,812. It has been in operation for more than a full year and has given very gratifying results. During the month of July, 1942, the peak demands were met effectively with the automatic operation of the 150 g.p.m. unit. During one severe electrical storm there was a power outage at the booster station, and the check valves functioned properly and admitted gravity flow to the area.

Pressures have been raised to a range between 45 and 60 lbs. throughout the area, and consumers are pleased and satisfied. Practically no maintenance has been required during the first year of operation. A member of the water department visits the station once a day for inspection purposes and to change the chart on a recording pressure gauge.

One interesting problem developed in three residences, all within 500 feet of the pumping station. The sound of the pumps and motors seemed to be transmitted through the water, and the resonance set up in the three residences was very annoying. Several theories were presented and experimented with before the solution was found. This annoyance was finally silenced by installing a 3" diam. surge pipe, about 4 feet high, connected to the house service ahead of the meter, this pipe being air tight so that the air within it acts as a cushion and absorbs the vibration of the water, thus reducing the resonance in the homes.

Measure Your Wells Now

(Continued from page 18)

wells have a steep drawdown but recover readily due to high permeability of the material in which the well is drilled. Others have a steep drawdown but do not recover so readily due to the low permeability of the aquifer. In making drawdown studies it is often interesting and instructive to determine how far outward from your pumping well the cone of depression created by the pumping extends. This can be determined if a number of other wells in the same aquifer, or water-bearing sand, are nearby. Some wells, such as those in loose gravel, have a large cone of depression that extends many feet from the pumping well.

Besides permeability of the water-bearing sand, there is another factor which influences drawdown. This is the condition of your screen or screening gravels. Sometimes the screen or screening gravels will become clogged with precipitated mineral matter which, of course, reduces the amount of water entering your well. In some cases, the screen or gravel becomes clogged with fine silt drawn in by the pumping or the natural flow of the water. The clogging of the screen or gravel by precipitated mineral matter can be remedied by acid treatment but this should be attempted only by experts in the well drilling business. The sand and silt can sometimes be flushed from the screen or gravel by water under pressure being forced through them.

In measuring wells, the observers of the United States Geological Survey use a steel tape with raised letters. On the end of the tape which is lowered into the water is rubbed some chalk. This chalk enables the observer to see the water line more clearly than when it is not used. Tapes without raised letters do not take the chalk readily and are more difficult to read.

Permanence of Supply Determined

If any of you water works operators are willing to make these measurements, we would be glad to furnish you with mailing cards to send us weekly the report on your wells. We will keep track of the changes in water level over as long a period of time as you keep the measurements. We will be glad to advise you in regard to the permanance of the supply, when it is advisable to have some local driller clean the wells, and when it may be necessary to prospect for additional supplies.

Treatment of Industrial Wastes

Latest information published by the U. S. Public Health Service on treatment of wastes from brewery, cannery, coal washing, coke, cotton, distillery, meat, milk, oil, paper and tannery industries.

THE most comprehensive discussion of the treatment of industrial wastes that has ever been published, we believe, has just been made public by the U. S. Public Health Service, in the form of a supplement to the final Ohio River Pollution Survey Report. It is in the form of "Industrial Waste Guides", one for each of eleven classes of industries,—Brewery, Cannery, Coal Washery, Coke, Cotton, Distillery, Meat, Milk, Oil, Paper and Tannery. Each guide is complete in itself and is bound separately for distribution to the industries directly interested.

The report is based upon investigation of the 1800 waste-producing industrial plants in the Ohio River basin, which includes part or all of the states of Pennsylvania, Virginia, W. Virginia, N. Carolina, Georgia, Alabama, Ohio, Indiana, Illinois, Kentucky and Tennessee. The wastes from these plants contribute to the river a pollution load equivalent to the sewage from nearly 10,000,000 population.

All the guides are prepared along similar lines, with the following characteristic features: 1—An abstract. 2—Description of the process producing the waste. 3—Enumeration of raw materials and products, their quantities and number of employees. 4—Sources and quantities of wastes. 5—Characteristics of the different wastes. 6—Pollution effects. 7—Remedial measures. 8—Bibliography. Also samples of forms used in collecting data concerning individual plants and making reports based upon them; and flow diagrams illustrating in diagrammatic form the industrial process steps and recovery practices.

The measures for reducing waste pollution are considered generally under three heads: 1—Changes within the plant itself. 2—Treatment with municipal sewage. 3—Treatment in a special industrial waste treatment plant. The first, which is usually the most economical, may involve re-use of all or part of the waste within the plant, development of by-products, changes in plant processes, or merely greater care in plant operation to reduce the amount of material discharged as waste. Occasionally it is possible to completely eliminate pollution and recover valuable by-products, but ordinarily some pollution remains and some expense is involved.

In a general introductory discussion, the report states that many industrial wastes can be treated quite effectively with municipal sewage, though it often is necessary to pre-treat the waste at the source or segregate within the plant certain portions that would damage the sewerage structures or treatment processes. This method is the simplest from the standpoint of the industry and also is the most satisfactory from the standpoint of administration of pollution abatement; it reduces the number of possible sources of pollution and concentrates responsibility for effective waste treatment, but usually requires special provisions in the municipal plant.

For many types of wastes, special industrial waste treatment plants employ essentially the same processes as sewage treatment plants. Other types require specially developed processes. Most use the principle of sedimentation for removal of settleable solids.

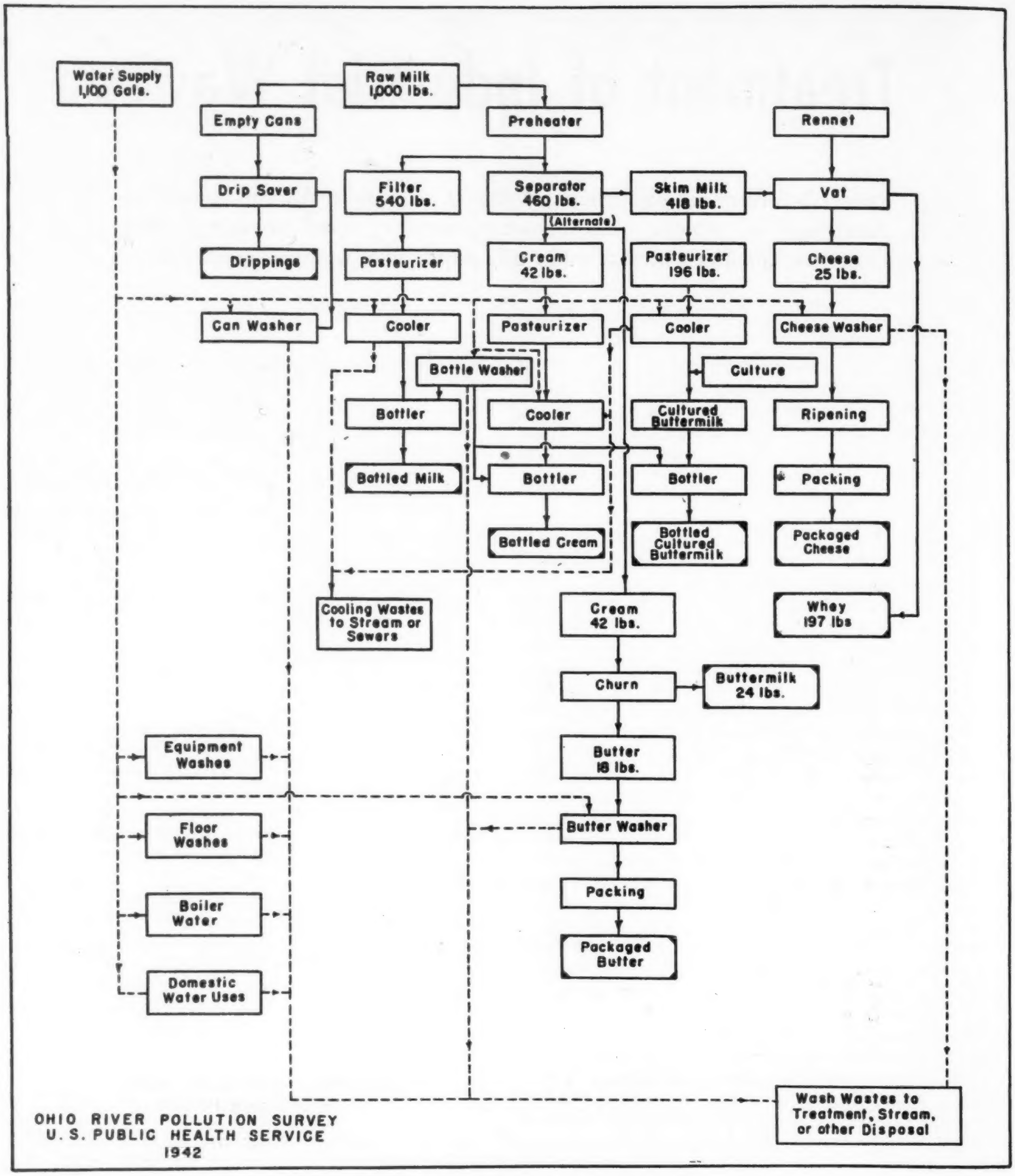
In the treatment of industrial wastes, chemical precipitation is popular, due largely to its ability to operate unaffected by greatly varying loads and toxic materials and to its less capital cost compared to biological processes. Removal of settleable solids is not difficult, but satisfactory methods for the relatively complete removal of B.O.D. are available for only a few of the more common types of wastes. There is a pressing need for the development of more efficient and economical methods for relatively complete treatment of other types of wastes.

Of the 1604 plants reported upon, 516 discharge to municipal sewers and it is suggested that the wastes of 626 others may be so disposed of. The industry having the greatest number of plants in the area is the milk, totaling 253 plants; second is the canning, with 218 plants; there were 174 steel plants, 173 meat and 122 textile. All others numbered less than 70 each. A brief synopsis of the "Guide" for the milk industry is given to indicate the scope of information available in these excellent pamphlets. This covers 35 pages and our space permits giving only a very brief abstract.

Industrial Waste Guide to the Milk Processing Industry

Plants are classified as receiving station, bottling works, cheese factory, creamery, condensery, dry milk plant, ice cream plant, and general dairy. The processes at the various plants are described and the wastes from each, the average sewered population equivalent in B.O.D. and suspended solids per unit (1,000 lb. of milk received), and the analytical results obtained by treatment. Average number of employees per unit are given. The sources and quantities of wastes and their characters, including (in ppm) the total solids, organic solids, fat, ash, milk sugar, protein, 5-day B.O.D. and oxygen consumed of whole milk, skim milk, butter-milk and whey. Various other analytical data relative to products and wastes are given.

Sixteen pages are devoted to "Remedial Measures", classified as "By-product Recovery" and "Treatment".



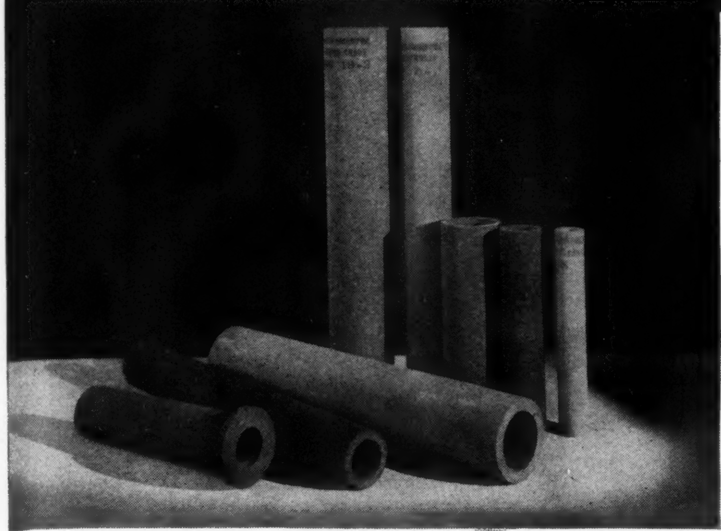
Flow diagram of milk products plant. General dairy.

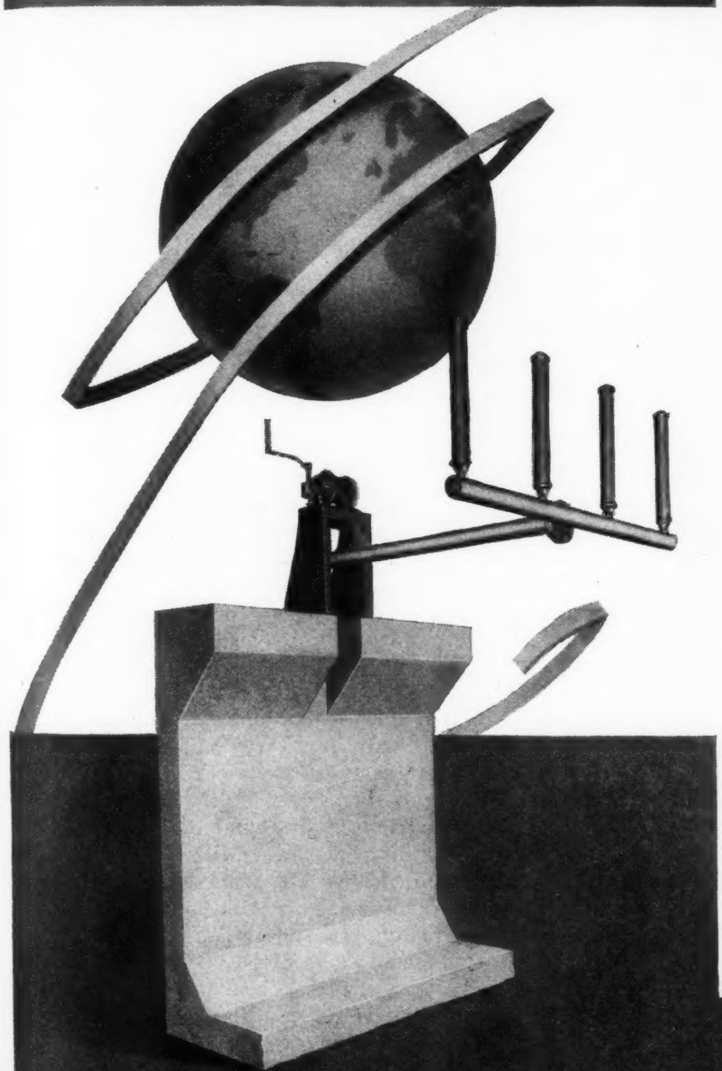
The former include drip savers, manufacture of skim milk by-products (chocolate beverage, powder, casein, albumin, lactose), and utilization of whey and buttermilk.

The treatment processes discussed are dilution, irrigation, Imhoff tanks, septic tanks, anaerobic stabilization (in digestion tanks), biological filtration, activated sludge and the Guggenheim process. Filtration "has been found to be the most generally applicable treatment method for milk wastes", and descriptions are given of lath filters, sand filters, coarse media trickling filters, and high-rate recirculating filters. Imhoff tank treatment is not considered to be of much value for milk wastes. Opinion concerning septic tanks is divided. Digestion tanks would give 95% reduction of pollution and produce considerable gas to be used at the plant, but the process has not been used commercially. Two plants using the activated sludge method are noted, and several using the Guggenheim process.

A table gives the installation and operating costs of six trickling filter plants, two activated sludge, two Guggenheim and one Mallory.

Finally is given a flow diagram of a general dairy products plant, showing step by step the progress from raw milk to bottled pasteurized milk, bottled cream, packaged butter, bottled buttermilk, packaged cream, and whey.





Mixed-in-Place Resurfacing in Whitman, Mass.

By J. CARROLL BOYNTON
Highway Surveyor, Whitman, Mass.

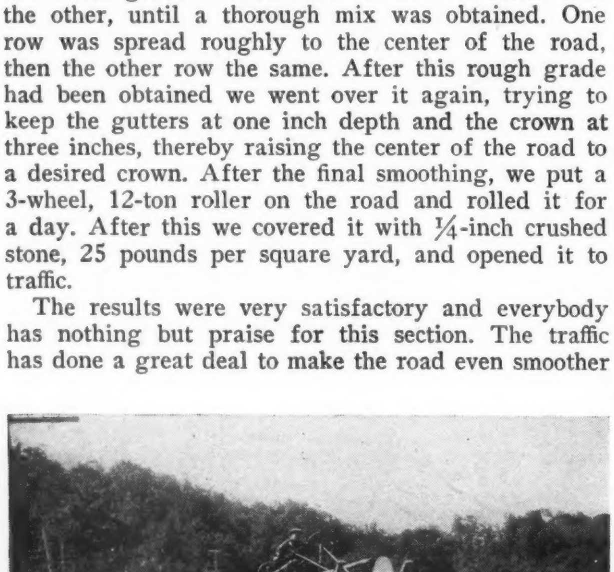
THE 36-foot roadway of a street through the residential section of Whitman was constructed in 1932 by removing the old tar surface and cutting the grade in spots and reshaping the existing base so uncovered; then placing on this three inches of 2" stone, penetrating it with asphalt, locking with ¾" stone, and applying an asphalt seal coat with pea stone covering.

Because of the poor base, this road became so rough within two years that in some places water left the gutter and flowed to and along the settled crown. The most practicable remedy appeared to the writer to be to resurface with a mixed-in-place top, which was applied last year as described below.

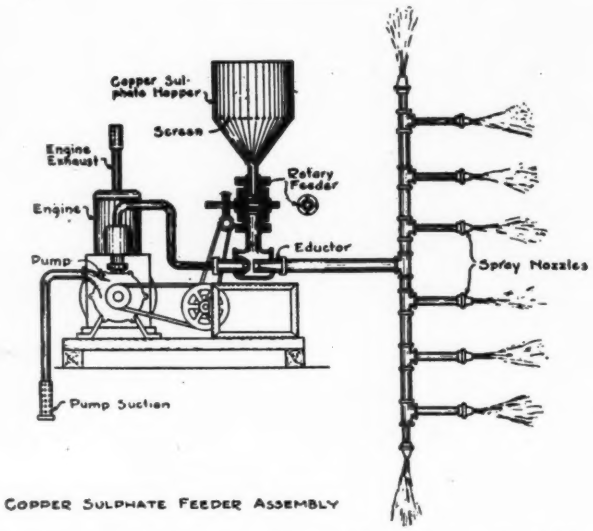
I calculated a 2-inch thickness over the whole width, concrete gutters included. Then I took a stone box 7½ feet wide and set the feed depth 4.8 inches deep using ⅝ inch roofing gravel for material (this being about two-fifths the cost of crushed stone of the same size). Next we ran out two rows of stone, each 1,000 feet long, one on each side of the street.

By weighing and calculation we found this stone weighed 108 pounds per cubic foot. The box spread 3 cubic feet per running foot, and by spreading this 9 feet wide with the motor grader, this made one square yard per running foot. By figuring the tar at six per cent by weight, using 9.34 lbs. per gallon, it made 2.08 gallons per square yard, or to the running foot for each row of aggregate. We used 2 gallons per square yard for convenience. Using a distributing truck on the stone, we sprayed two gallons per square yard, using T-6 grade Barrett Tarvia. Then the motor grader mixed first one row of stone then the other, until a thorough mix was obtained. One row was spread roughly to the center of the road, then the other row the same. After this rough grade had been obtained we went over it again, trying to keep the gutters at one inch depth and the crown at three inches, thereby raising the center of the road to a desired crown. After the final smoothing, we put a 3-wheel, 12-ton roller on the road and rolled it for a day. After this we covered it with ¼-inch crushed stone, 25 pounds per square yard, and opened it to traffic.

The results were very satisfactory and everybody has nothing but praise for this section. The traffic has done a great deal to make the road even smoother since the job was completed. The whole thousand feet cost about $900, which makes the price per square yard 22½ cents. This of course was last year's prices. This year they are somewhat higher. The prices we used last year were 90 cents per ton for roofing gravel, 9 cents per gallon for tar, $2.25 for ¼-inch stone per ton, and $4.00 per hour for the grader. Roller hire cost $2.50 per hour.



Resurfacing with tar and stone—mixed in place.



Copper sulphate feeder assembly used by Columbus, O., Division of Water.

Cannery Waste Disposal by Lagooning

The Wisconsin Committee on Water Pollution, reporting on the abatement of pollution caused by cannery wastes, says: "Due to the fact that construction of chemical precipitation plants for vegetable canning wastes is unlikely for the duration of the war, and also in view of the need for almost complete elimination of pollution loading on streams affording limited dilutions, it was decided to carry out a series of experiments with lagooning systems of waste disposal."

While lagooning prevents pollution of streams, decomposition of the wastes in the lagoons generally causes an odor nuisance which makes it decidedly objectionable in most localities. Experiments in 1940 had indicated that a dose of sodium nitrate amounting to 40% of the 5-day B.O.D. would control the odor and would cost about 0.4 cent per case of No. 2 cans.

Further data seemed necessary, and early in 1942 experiments were begun at the Lake Mills, Wis., plant of the Libby, McNeill, Libby Co., with sanitary engineer R. E. Borchardt in charge, funds for which were furnished by the Wisconsin Canners Ass'n. Other experiments were conducted at Medford during the 1942 canning season. In both of these, chemicals were used; sodium nitrate at Lake Mills and sodium hydroxide at Medford. Also observations were made of lagooning without chemicals at Iron Ridge, Theresa, Eden and Sun Prairie. All of these plants were canning peas only.

As the result of these experiments and observations, the committee concluded that "the use of sodium nitrate has definite promise in the control of atmospheric pollution. The use of sodium hydroxide in sufficient quantities to maintain an alkaline condition of the waste in the lagoons appears to be effective in suppressing odors, and may prove satisfactory for application at isolated sites. Recommendations will depend

on the observations and experiments at Medford, where soil is unfavorable for rapid absorption of waste. Chemically precipitated, or treated, cannery waste can readily be absorbed in sand-filled areas and excellent results have been obtained in disposing of the wastes in areas composed largely of sand and gravel."

Wood Septic Tank in Baltimore

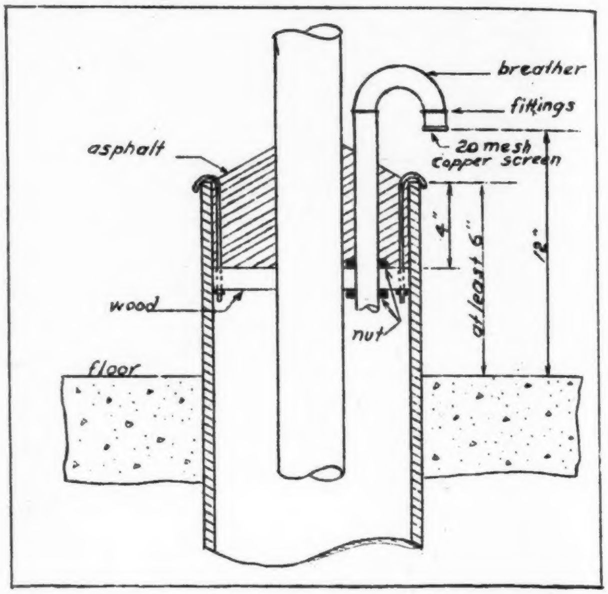
A section of East Baltimore, Md., that has been developed with low-cost defense housing is so low that sewage from it would have to be pumped to reach the gravity mains and treatment plant. This the city proposes to do eventually but, because of lack of funds and difficulty of obtaining pumping equipment, this has been postponed and instead a septic tank has been constructed to serve the 300 homes of the development.

It is not expected that this will remain in use for more than 20 years, and it was built of pressure-creosoted yellow pine, since this is believed to have a life at least that long, would cost less than concrete, and could be built more quickly with a minimum of skilled labor.

The tank is 16 x 32 ft., with a depth of 16 ft., divided into two sections by a partition running the length of it. The top of the tank is 2 to 3 ft. below finished grade. The entire structure is built on a concrete slab and the extreme depth, while not necessary to serve the number of home units planned, was decided upon as simpler and cheaper than designing the top of the tank to carry 8 to 12 ft. of earth cover. Actually the tank is only filled to a level of about 8 ft. from the bottom. It is constructed of double 4 x 6-in. studs inside and outside, of 2-in. tongue and groove planking with 4 x 6-in. wales, 6 x 6-in. inside struts in the upper 8 ft. to equalize the earth pressure, and 1 x 10-in. double X-bracing also in the upper 8 ft. of the tank. It was designed both for maximum external and internal loads, and the center partition is designed to carry a full load in one-half of the tank while the other half is being cleaned, if that procedure is ever necessary in the future.

Effluent from the tank at present discharges into the storm water system, and as bacteriological action is thorough within the tank this feature is not considered objectionable, even though the effluent eventually reaches an open semi-tidal run about one mile from the home project.

The city of Baltimore plans to pick up the sewage from this development within five years; but should changed financial or world conditions interfere with these plans, the present creosoted tank is believed able to serve for many years longer.



Method of sealing well casing approved by the State Board of Health of South Dakota.

Check Dams On New York Highways

Where run-off channels leading to highway culverts are steep and flash floods bring large amounts of detritus to them, much of this can be caught by building check dams in such channels. New York State has used rock-filled timber cribs for this purpose. Two have been built recently on Route 17 about 20 miles east of Elmira, across a channel which, in times of flood, brought down considerable quantities of small stones that clogged a culvert. These dams were placed 100 ft. and 180 ft. respectively from the culvert, and intercept the stones in the basins above them.

These cribs are approximately 4 ft. wide, consisting of spillway sections about 5 ft. high and 30 ft. wide in the up-stream crib and 25 ft. in the lower, and an extension into the bank on each side of the channel which is 4 ft. higher. The cribs were built of 8 x 10 in. creosoted timbers fastened together with ⅜ in. drift pins. All the timbers were cut to length and holes for the drift pins bored before the creosoting, which was done according to the standard specifications of the American Wood Preservers' Association with 12 lb. of creosote per cubic foot. Thus the construction in the field consisted only of laying up the fabricated members, driving the drift pins, and placing the rock fill.

Creosoted timber crib built along New York highway to stabilize run-off channel and minimize scour.

The cribs were divided into cellular spaces approximately 6½ ft. long by 4 ft. wide. A grouted riprap pavement or apron 10 in. thick and 6 ft. wide was laid below each crib to prevent erosion by the overflow.

Effect of Industrial Wastes on Sewage Disposal

In a report to the State Water Commission of Connecticut on research and laboratory work performed by the Hall Laboratory of Chemistry, Wesleyan University, C. R. Hoover says that large-scale investigations of the effect of industrial wastes on common methods of sewage disposal were carried out in the municipal treatment works of Middletown, the results of which were briefly as follows.

Of typical composite textile waste (eliminating one component which was of a very toxic nature), 10% by volume is the maximum that can be added to sanitary sewage without effecting a decided decrease in the rate and completeness of digestion of the resulting sludge, and at no time during the day can it exceed 15%.

Another extensive series of investigations has been carried out on the effect of copper on separate sludge digestions. Copper has long been known to have deleterious effects on biological processes, but the insidious nature of the effect of small amounts of copper in sewage upon the decreased efficiency of the operation of sludge digestion has not been generally recognized; that is, a plant may be operating with a normal gas production and reduction of volatile organic matter, but require a longer period for the development and completion of digestion than would be possible if a plant is to be operated at its full capacity. One of the most striking observations during this investigation was the remarkable increase or concentration of copper in sedimented sewage sludge, obtained from relatively small traces of copper in incoming sewage; for example, a sewage containing 0.5 p.p.m. of copper was found to produce a sludge containing over 100 p.p.m. It was also found that the nature of the chemical compound of the copper precipitated in the sludge is important in its effect on sludge digestion, and the nature of this compound can be controlled by simple changes in the operation of a sewage plant. The source of interfering copper cannot always be traced to industrial wastes. It is found to be present in uncontaminated streams and to be increased as the result of copper sulphating of reservoirs and to be further increased due to the nature of the material used for water piping and, especially, the nature of the domestic hot-water heating equipment. It should be pointed out, however, that none of these contributing factors is of sufficient importance to involve any health hazard, but that the sewage produced from such combined sources may have objectionable effects under certain conditions in separate sludge digestion. In general, when the amount of copper in sewage exceeds 1 p.p.m., a decrease in the efficiency of the operation of sludge digestion may be noted. Final conclusions regarding the elimination of this effect have not yet been reached, but it appears that the proper control of copper and other metals by a small amount of a soluble sulphide will aid in eliminating any harmful effects when copper is present in amounts up to 1.25 p.p.m. If it is present in excess of this amount, it can be traced to industrial origins and should be lessened by treatment at the source. Suggested treatments included the use of scrap iron filters with acid wastes, and sodium or calcium sulphides followed by copperas with alkaline wastes.

The effect of chromium waste on sewage disposal is a new problem. Investigations in this laboratory and observations in sewage plants indicate that chromium compounds are not accumulated with sewage sludge in the same degree as in the case of copper, but, when so precipitated, they show comparable harmful effects. Soluble chromates show much less interference with sludge digestion than soluble copper compounds, although the persistent yellow color of chromates is objectionable. A series of laboratory digestion experiments indicate that, when 200 p.p.m. of precipitated chromium is present in a sludge, the rate of digestion is noticeably reduced. For a constant amount of chromium plating waste in a sewage, the larger the sewerage system and the more diversified the industrial waste, the more objectionable the effects caused by the chromium, due to the more complete reduction of chromates. When more than 1 p.p.m. of chromium is present in sewage, as received at a sewage treatment plant employing anaerobic digestion, it is desirable to install chemical treatment processes, such as were discussed above, to remove the chromium at the source.

Maryland's War Emergency Water and Sewerage Problems

DUE to the fact that a large share of the activities which had to do with the national defense program were centered in Maryland it became necessary in 1941 to expand a number of existing water and sewerage systems and to construct new ones to accommodate the unprecedented increase in population resulting from the numerous Federal and privately developed housing projects and the enlargement or construction of military and naval reservations and defense industries.

Extensions of existing water and sewerage systems were made at Fort Meade reservation and to a 115-unit Federal housing project adjoining; to a 350-unit housing project at U. S. Naval Powder Factory, and to a 530-unit Federal defense housing project at Havre de Grace. New sources of water supply were provided at the Aberdeen Proving Ground, Edgewood Arsenal, for a 650-unit Federal housing project at Glymont, and for a 200-unit Federal housing project at Edgewood. Water was provided for a 250-unit Federal housing project at Aberdeen by extension of the city's mains; and for two Federal housing projects at Carderock, one at Forest Glen, and for a 1,000-unit expansion of "Greenbelt" (a Federal housing development), by connections to the mains of the Washington Suburban Sanitary District.

Sewerage systems were built at Edgewood Arsenal, Glymont, Aberdeen, Carderock, Forest Glen, Greenbelt, and Federal housing developments at Turners Station and Camp Holabird; and treatment plants at Aberdeen Proving Ground, Edgewood Arsenal, Aberdeen, Carderock (temporary) and Forest Glen (temporary).

Of approximately 30 proposed defense housing projects, ranging from 10 to 1,000 homes, two of them sponsored by Federal agencies, most had to be abandoned because of the absence of sanitary facilities

within economical reach and the fact that no local means of sewage disposal were feasible. Most of these were located in the Baltimore County Metropolitan District, which is now studying the development of a comprehensive long-range plan for the ultimate collection and disposal of sewage from these areas.

On account of the unprecedented industrial and residential developments in this metropolitan district, existing water and sewer facilities, which under normal conditions had been of adequate capacity, were greatly overloaded. The Baltimore County Metropolitan District authorities with the aid of the Work Projects Administration, constructed a trunk sewer in Eastern Avenue from the Glenn L. Martin Co. aircraft factory to the existing sewage pumping station in Essex, with an intermediate sewage pumping station at Middle River, so that all sewage is pumped to the Back River sewage treatment works at Baltimore City. During December a contract was awarded by the Metropolitan District authorities for the construction of a 20-inch cast-iron sewage force main from the Essex sewage pumping station under Back River to the Back River sewage treatment works to supplement the existing 14-inch force main. These sewerage improvements will provide for the increased sewage flow from the greatly enlarged Martin plant and in addition will accommodate the anticipated future residential expansion now proposed in this area.

Additional water supply was also required in this rapidly growing section and as a result a 16-inch water main was extended from Baltimore City to the Martin plant to supplement the existing and inadequate 12-inch main. The latter part of December negotiations got underway for the extension of a 36-inch water main from Baltimore City to the Martin plant which it is estimated will cost approximately $1,100,000. This extension will reinforce the existing water mains now serving the plant and the nearby housing developments since the present mains are not of adequate capacity to furnish sufficient water for domestic, industrial and fire uses. The water supply needs for the residential development in this area, coupled with the volume of water required to meet the industrial and fire fighting demands, so far exceeded the capacity of the existing water supply facilities that the larger main feeder was necessary.

Effect of Lime in Coagulation of Sewage

(Continued from page 17)

ppm, averaging 6 ppm; whereas with poor coagulation the suspended solids strained out by the filter varied from 15 to 46 ppm. The average removal of suspended solids by the sand filters, for all results obtained, amounted to 12 ppm. The filters are, therefore, of greater use with poor coagulation and should be considered as a safeguard and polishing agent rather than as an effective strainer to carry consistently a high load.

Conclusions

1. Results obtained, observations and calculations made during experimentations on a plant scale with different types of calcium hydrated limes of approximately the same chemical composition, used in conjunction with ferric sulphate and ferric chloride, indicate that one lime may be definitely superior to another. Using limes, prepared from Franklin, Farnam and Bellefonte deposits and bought in the open market, together with ferric sulphate and ferric chloride, the effectiveness of the limes appeared to be in the order given.

2. The cost per million gallons of sewage treated was not radically different with the various limes, but for the same cost, suspended solids removal and B.O.D. reduction were materially better with the Franklin lime than with the Bellefonte lime, and slightly better than with the Farnam lime.

3. The various limes gave a similar uniformity of pH values, but the Franklin lime gave persistently higher values.

4. It appears that the effectiveness of lime in treating sewage containing grease and laundry wastes may be influenced by the type of lime used.

5. Until better specifications are available, the behavior and effect of a hydrated lime used in sewage coagulation should determine its value for a specific sewage, rather than its chemical analysis.

The above, written for PUBLIC WORKS, is a Journal Series paper of the New Jersey Agricultural Experiment Station, Rutgers University, Dept. Water and Sewage Research.

Fundamentals for Designing Low Dams

(Continued from page 21)

The apron walls should have a minimum thickness of 18 inches. The wing walls should have a minimum thickness of 30 inches and footings, as shown in Figures 10 and 11. The height of the apron wall above the downstream apron should be at least 1¼ times the height of the wing wall above the spillway lip. The apron wing wall should be backfilled with porous material and drained. The downstream end of the backfill should be riprapped with large rocks.

Drains should be constructed as shown in Figs. 10 and 11, these being placed at such an elevation as to permit free flow from the outlet.

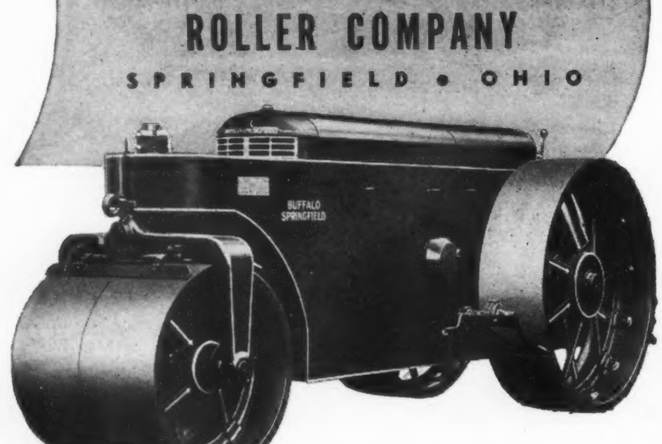
f. *Profile of the Dam.*—Freeboard should be provided equal to maximum expected wave height. A minimum freeboard of 1½ to 2 feet is recommended for small dams. For higher dams, or for dams retaining large lakes, the freeboard may vary from 10% of the height to the square root of the height of the dam. The width of the top, unless determined by roadway or other needs, will approximate 15% of the height; but a minimum is fixed in the computations for design by the necessity for stability of the dam.

The relation of the width of the base of the dam to its height depends upon the uplift assumption and various other factors. In general, for a small dam the base width will be 0.65 to 0.70 of the height, not including freeboard. The necessity for batter on the upstream face is determined by the need to prevent tension in the concrete when the reservoir is empty. The downstream face batter is that necessary to provide the required base width.

g. *Outlet Structures Through Dam.*—On small dams a pipe is ordinarily used, and the valve stem may be brought up through the concrete of the dam. The size of the pipe should be such that it will carry more than the normal flow of the stream or streams discharging into the reservoir. Frequently, the pipe used to carry the stream during construction is used. The problem is much easier to solve than in an earth dam.

h. *Spillways.*—Overflow sections have already been discussed. Where separate spillways are used, the data already given for earth dam spillways will apply. Adequate protection by riprap or piling or both should be provided for the toe of the overflow section or spill-


Chlorine Fights with the Fleet!
America is the United Nations' production line! Down that production line now comes an endless number of materials—supplies for our Navy, our Army, our Air Force and our Allies. *Chlorine is helping produce them!*
SYNTHETIC RUBBER
GASOLINE
EXPLOSIVES
TEXTILES
PLASTICS
DYESTUFFS
SOLVENTS
TREATMENT of WATER
STERILIZATION
MOTOR COOLING FLUIDS
HIGH PRESSURE LUBRICANTS
SOLVAY SALES CORPORATION Alkalies and Chemical Products Manufactured by The Solvay Process Company



way. Figs. 10 and 11 indicate methods used on low dams built by the C.C.C. in North Dakota.

i. *Construction.*—Stream control is the first problem in construction. A portion of the channel is dammed off so that construction can be carried on in it and a pipe placed of suitable size to carry the flow during construction. It may be desirable to use this pipe later for an outlet pipe; this necessitates that the pipe be placed at the desired line and grade.

Unlike an earth dam, the whole of which must be carried up at one time, a part of a concrete dam may be wholly completed before the adjoining section is started. Therefore, after the stream flow has been diverted and a pipe placed permanently to carry the flow, the section of the dam containing this pipe may be completed at once. The stream is then turned into the outlet pipe and the remainder of the dam completed. The necessary valve or other control is installed in the pipe at the time of construction. The type of valve used depends upon the height of dam and volume of water to be discharged. On pipes up to 12 or 18-inch, a gate valve is satisfactory. However, under high heads such valves are difficult to open because of the pressure, and special valves must be used.

The dam should be keyed to the foundation. Construction as a monolith is not necessary; it is preferable to build it in sections of convenient size, depending on mixer capacity. Alternate sections may be poured, each from 10 to 40 ft. long, and allowed to set before the intermediate sections are constructed. Keyways are formed in the ends of each section and the exposed ends should be painted heavily with bituminous material to prevent adhesion of the concrete of the intermediate sections. A copper or other V-strip should be placed at each vertical joint, extending into both sections, to prevent leakage.

Horizontal or construction joints may be placed as necessary. Before pouring the new concrete, the surface of the previous pour should be very thoroughly cleaned of loose material and laitance. To provide resistance against sliding of any section on the one below, the surface of each horizontal joint is finished off at two different elevations, of about equal area, with a vertical step 6 inches or more high between them, the downstream surface being higher than the upstream.

Good concrete should be used; formwork should be of good quality; the concrete should be spaded or vibrated to prevent honeycomb.

Well-built rubble masonry can be used instead of concrete. However, there are nowadays few masons capable of doing high-class work.

Timber Crib Dams

Timber crib dams may be used where the drainage area is large, where an overflow dam is necessary, and where the materials for a masonry dam are costly or the foundation unsuitable. Timber dams are suitable for heights up to 8 or 10 feet. Spillway capacity requirements will be the same as for any other dam and may be determined from previous data.

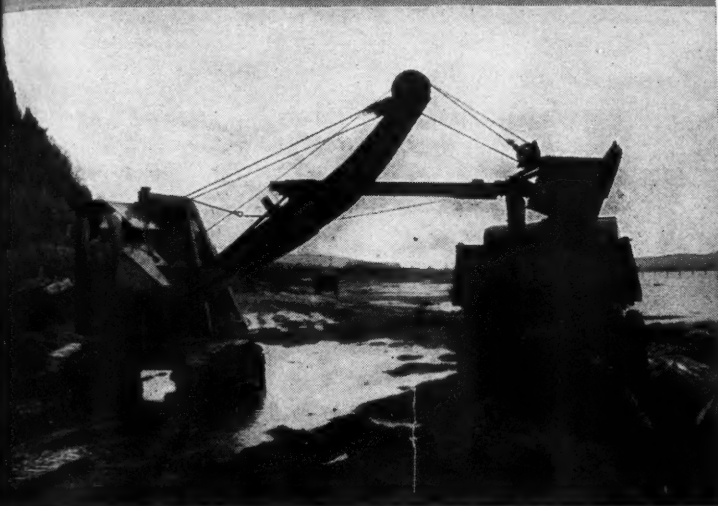
A type of dam suitable for use is shown in Figs. 12 and 13. The abutments or ends of the dam must be well keyed into the stream banks to prevent washing out. The piling or cutoff wall must be driven to a depth equal to the height of the dam or to an impervious stratum, using two rows of plank, pointed as shown in Fig. 5. Planks 2 inches thick are adequate if they will withstand driving; otherwise 3-inch planks are needed. The joints in the two rows should be stagged to reduce leakage. The piling should be securely fastened to the crib and the joints protected

BUILT TO OUTPERFORM

★ ★ ★

They're Speeding The Biggest Task In History

"99-M" POWER GRADERS: Speeding coal and critical metals from mines to mills; constructing and maintaining vital highways; helping to complete airfields, camp sites, ordnance plants, and housing projects ahead of schedule.

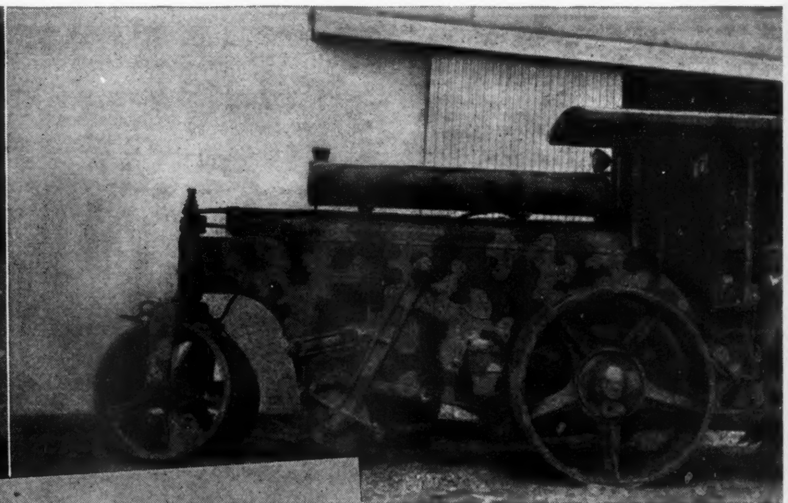


BADGER SHOVELS AND DRAGLINES: Meeting the time limit and manpower challenge by fast, consistent performance on airport and war plant construction; loading gravel and keeping materials moving at mines.

PORTABLE CRUSHING PLANTS: Operating *at the job* to supply stone, gravel, other materials essential to war construction; eliminating cross hauls, releasing transportation equipment, and conserving rubber.

PATROL SWEEPERS: Hundreds of these nimble, efficient Sweepers are keeping runways and hangars clean and safe. Others are used to conserve time and manpower in and around industrial plants, warehouses and docks.

ROLLERS: Building vital roadways, airfield runways and Army Camp thoroughfares . . . and turning jungle trails into truck roads to reach new sources of critical war materials.



Austin-Western

THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois

MOTOR GRADERS • BLADE GRADERS • ELEVATING GRADERS • SCRAPERS • CRUSHING AND SCREENING PLANTS • ROLLERS
ROLL-A-PLANES • MOTOR SWEEPERS • SHOVELS AND CRANES • SCARIFIERS • DUMP CARS • TRAIL CARS

as shown in Fig. 5. Lag screws are efficient in fastening the piling and the decking to the cribs.

The general dimensions of this dam are shown in Figs. 12 and 13, including the width of the top, the slope of the face, and other details. The ends of the spillway section should be protected with planking, as shown.

The piling at the downstream end of the apron need only be of one thickness but this should reach a minimum depth of 2½ feet to insure the dam against undermining. A space of 1 inch should be allowed between planks in the downstream piling so that any water accumulating in the crib can drain off when the backwater lowers.

Cribs, abutments, and apron must be filled with gravel, or with rock small enough to be packed into the spaces between the timbers.

The banks along the apron should be protected by riprap, the location and amount depending on local conditions. In all cases, riprap should be laid to a 2-foot depth and a minimum length of 10 feet downstream from the apron. (See Figure 13).

The crib and piling should be lined up with a transit or chalk line so that the finished structure will have no open spaces between the sheet piling and the crib. This also produces a much neater job. The cribbing should be bolted together with ¾-inch round bolts.

The upstream deck should be sloped and the abutments should be placed at an angle of 45 degrees in order to increase entrance velocities for all heights of dams. The decking consists of 2-inch plain planks. The stringers are 6″ × 6″ placed 4′ on centers, or closer if necessary to stiffen certain parts of the structure.

The foundation should be excavated to a minimum depth of 12 inches. If unstable soils are encountered, the excavation should be continued to a greater depth until a better foundation is secured. Careful judgment must be exercised in preparing the foundation.

Types of Timber Dams.—There are three types of timber dams; (1) The rock-filled crib, just described; (2) the frame and deck dam, in which the water pressure on a sloping deck helps to give stability; (3) the crib and deck combination, which utilizes both of these.

Design of Rock-Filled Crib Dam.—This is actually a gravity-type dam and is subject to the same analyses as the masonry dam. Rock filling will weigh about 110 pounds per cubic foot, if very closely packed. For usual design purposes, a weight of 90 to 95 pounds per cubic foot for the crib should be used. Uplift pressure is absent because of the porous nature of the fill. Allowance should be made for the buoyance of the timber that is submerged. The vertical load, that is, the weight of the dam and of the water on it, should be 2.5 to 3.5 times the horizontal pressure of the water and of any fill on the upstream face of the dam in order to insure its safety against sliding.

Design of Frame and Deck Dam.—The structural design of the deck and frame is based on beam and column loading for the weight of the water on the deck. The structure normally has little weight and, to resist the horizontal thrust of the water behind it, must be anchored firmly, as by burial of the sills in the foundation strata.

Crib and Deck Dams.—The cribs provide some resistance to the pressure of the water, and additional weight results from the weight of the water on the deck, which should have a slope of about 2 horizontal to 1 vertical. Design should provide a factor of safety of 3.5 or 4 against sliding. Dams of this type are normally limited to a height of about 8 ft.

Floating a Timber Bridge Down a River

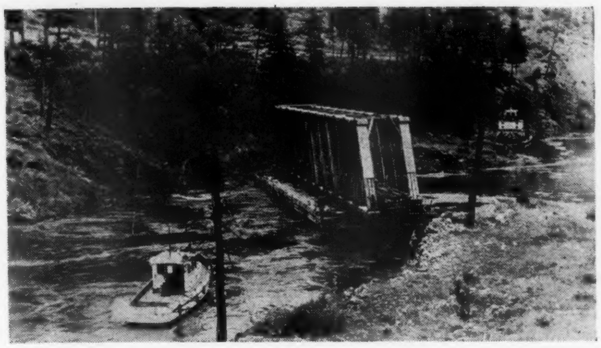
About 112 miles up-stream from the Grand Coulee dam, Kettle river, a tributary of the Columbia river, was crossed by a branch line of the Great Northern railroad. When the reservoir is full, the location of tracks and bridge at this crossing is under 2 feet of water, so a relocation was necessary.

The bridge was a timber one, built in 1902, but the timbers were still sound and it was desired to salvage them. The bridge consisted of two Howe truss all-timber spans, one 68 ft. long, weighing 90 tons, the other 151 ft. long weighing 210 tons, and contained 100,000 board feet of lumber.

To dismantle the bridge at its site would necessitate transporting derrick and piling 150 miles overland to this remote spot, and the engineers decided instead to transport the bridge to the derrick, by placing the spans on two barges and floating them down the Kettle and Columbia rivers to the dam, where they could be dismantled economically.

The Kettle was a swift stream, too narrow to permit this; but as the dam filled and backed up it would broaden the stream. However, in relocating the railroad a new bridge had been built a quarter-mile down stream, and if the water rose too high there would not be sufficient clearance under it to permit the passage of the barge-borne spans. The operation, therefore, had to be synchronized closely with the rate of rise of the water, and once begun must be completed in a hurry.

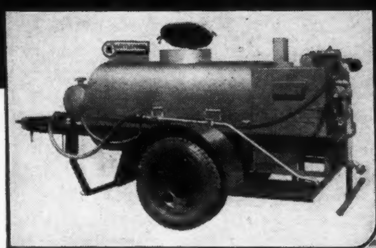
It took two days to bring the barges and the necessary tugboats from the dam, up the two rivers to the site of the bridge. The Kettle by now was widened and quieted by the waters which were steadily backing into it. In one day, a crew of 14 men freed the bridge from its moorings and swung it down onto the waiting barges. In another two days, it was at the dam, and in four days more it was dismantled. Its still-serviceable timbers were valued at $15 per 1,000 board feet.

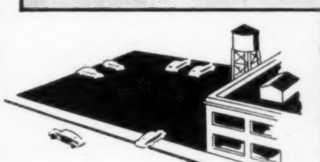


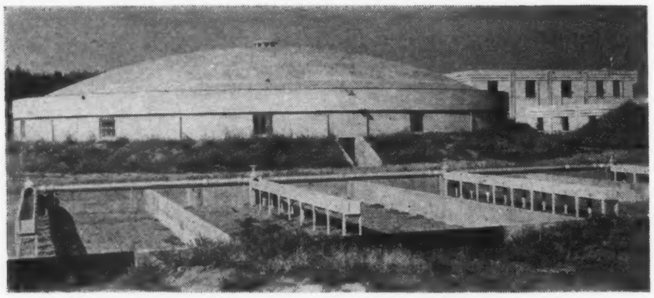
Floating a bridge span down a river for demolition.

Substitute Lead for Other Critical Metals

Under date of October 21, Erwin Vogelsang, Chief, Tin and Lead Branch, War Production Board, announced: "There is relatively more lead in relation to demand than there is copper, tin or zinc. Because of the desperate shortage of these metals, WPB now recommends that lead be substituted for these other critical metals wherever possible. This does not mean that we should try to use as much lead as possible. Substitution is the thing, not just consumption."







Brainerd sewage treatment plant. Concrete dome covers filter. Hitchcock & Estabrook, engineers.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Mutual Aid For Sewer Service

Having developed a mutual aid plan for water service, especially designed for protection in case of bombing damage, New York State O.C.P. advocates a similar mutual aid plan for sewerage departments. This includes preparing a detailed inventory of sewerage works personnel, equipment, materials and supplies and filing it with the zone coordinator. Also training a sufficient number of auxiliary workers in the fundamentals of sewer repair work and pumping station and treatment plant operation, to handle the problems that can be expected in the event of a catastrophe.[H49]

Removing Scum From Tanks

Johannesburg, South Africa, finds large amounts of grease in its sedimentation tanks, often in the form of large balls and floating as scum, the removal of which presented a problem which it solved as follows: The tanks are circular, radial flow. A 6" iron pipe from which a 90° sector had been cut was set radially in the tank, the lower edge of the slot just at water level, and connected with the sludge main. At first the scum was driven around to this scum pipe by a hose stream; but to save labor and water this is now done with air. Six ¾" pipes were set radially in the tank at 60° angle with each other, just below the surface, one in front of the slot in the scum pipe, each pipe having ⅛" holes at 6" intervals, all facing so as to drive the scum anti-clockwise around the tank into the scum pipe. These pipes are fed with compressed air at 10 lb. pressure from the activated sludge air system. In operation, air is first turned into the pipe nearest the back of the scum pipe, driving the scum to pipe No. 2; then air is turned into this to drive it to No. 3; and so on until the air from No. 6, just in front of the slot, drives the accumulated scum into the scum pipe.[D26]

Treating Pickling Liquors

Wastes from a plant at Meadville containing copper, nickel, chromium, with spent acid, were neutralized with lime, settled for 8 hrs. and the supernatant discharged into a creek, where it killed the fish. They were then carried by sewer to the city's activated sludge plant, with sludge digestion, where they killed the bacteria and reduced the gas yield 95% and the sludge digestion accordingly. Study indicated this was due to unremoved chromates in solution and copper sludge particles in suspension.

Satisfactory treatment was developed which consists of passing the acid liquors through a bed of scrap iron; then the separately collected cyanide wastes were admixed; then lime added to give a pH of 8.4. The resulting precipitates are quite gelatinous and flocculent and contain about 10% copper, 2% nickel, 20% chromium and the balance iron and calcium sulphate, and are disposed of by lagooning. The clarified effluent is discharged into the creek without developing any objectionable conditions.[E15]

Plant Operation At Minneapolis-St. Paul

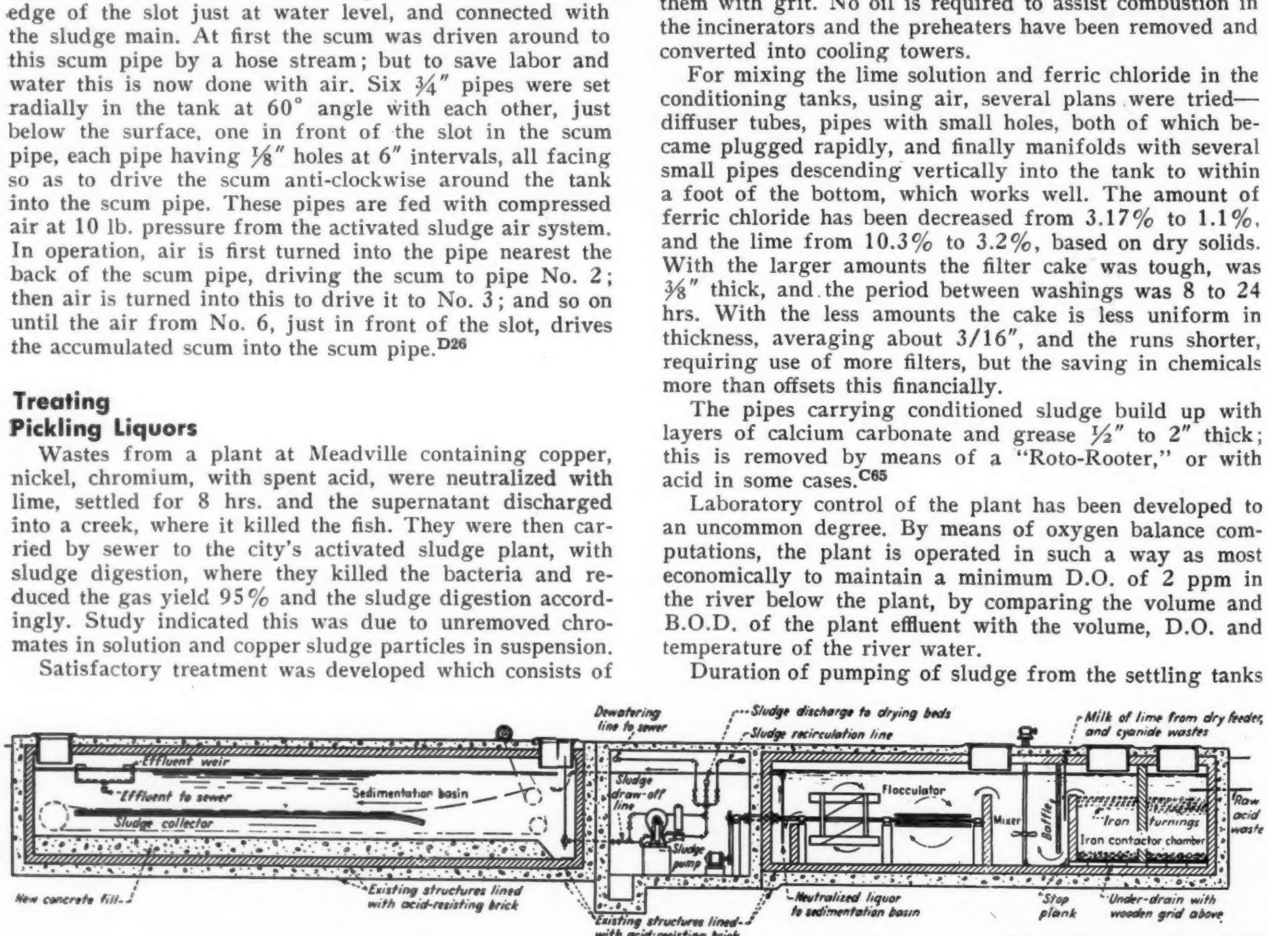
This plant has been operating since June, 1938. It consists of screen and grit chambers, flocculating and settling tanks, effluent filters, facilities for chemical treatment and chlorination, sludge concentration tanks, vacuum filters and sludge incinerators. Chemical treatment, chlorination and effluent filters have not been used because of high river flow and higher removal by sedimentation (75%) than anticipated. Also racks of 6" openings were found unnecessary and removed. The screenings grinders were found to be unnecessary because the amount of screenings is so small that it is practicable to dump them and cover them with grit. No oil is required to assist combustion in the incinerators and the preheaters have been removed and converted into cooling towers.

For mixing the lime solution and ferric chloride in the conditioning tanks, using air, several plans were tried—diffuser tubes, pipes with small holes, both of which became plugged rapidly, and finally manifolds with several small pipes descending vertically into the tank to within a foot of the bottom, which works well. The amount of ferric chloride has been decreased from 3.17% to 1.1%, and the lime from 10.3% to 3.2%, based on dry solids. With the larger amounts the filter cake was tough, was ⅜" thick, and the period between washings was 8 to 24 hrs. With the less amounts the cake is less uniform in thickness, averaging about 3/16", and the runs shorter, requiring use of more filters, but the saving in chemicals more than offsets this financially.

The pipes carrying conditioned sludge build up with layers of calcium carbonate and grease ½" to 2" thick; this is removed by means of a "Roto-Rooter," or with acid in some cases.[C65]

Laboratory control of the plant has been developed to an uncommon degree. By means of oxygen balance computations, the plant is operated in such a way as most economically to maintain a minimum D.O. of 2 ppm in the river below the plant, by comparing the volume and B.O.D. of the plant effluent with the volume, D.O. and temperature of the river water.

Duration of pumping of sludge from the settling tanks



Courtesy Engineering News-Record

Treatment plant as revamped for treating wastes at Meadville, Pa.

is controlled by frequent weighing of samples of that leaving the pumps; when the specific gravity falls to 1.025, corresponding to a solids content of 7.0 to 7.5%, pumping is stopped. However, more pumping is practiced to prevent septic action in warm weather, the pH not being allowed to fall below 5.6. Some fine grits seem to benefit concentration, filtration and incineration, and velocities in the grit chamber are held at 1.2 fps, increasing to 0.75 during storms.

To give the filter operators frequent checks on the chemical dosage, every 4 hrs. a calculation is made based on the pounds of cake solids which had left the filter and of chemicals added during the previous 4 hrs. This has been one of the factors in reducing cost of chemicals from $240 a day to $110. A daily balance between total solids input to the vacuum filter and total output from it permits discovery of errors in measuring equipment.

Reduction of dosage of conditioning chemicals reduced filter cloth binding from 15 grams per sq. ft. in 114 hrs. to 13 grams in 337 hrs. The binding material was found to contain 85 to 93% calcium carbonate and 3 to 8% grease with the higher dosages; and 68% lime and 24% grease with the lower. The lime now is removed from the filter cloth and splines by placing in the filter pan 600 gal. of water, 1 or 2 carboys of muriatic acid and aniline oil as an inhibitor, and revolving the drum with the cloth in place; this is done at intervals of about 350 operating hrs. and greatly increases the economic life of the cloth. It does not, however, remove the grease.

An all-over solids balance on the entire plant is made monthly. The monthly differences between actual and computed removals averaged 10%, while the discrepancy for the entire year 1941 was only 3.4%.[C64]

Cleaning Diffuser Plates

Iron pickling wastes in the sewage of Cleveland, O., cause rapid clogging of diffuser plates and tubes in the aeration tanks. These are cleaned as follows: Washed with water. Air dried. Immersed in 50% muriatic acid for one hour or more. Rinsed with water. Immersed for two hours in a solution containing 100 lb. of concentrated sulfuric acid, 10 lb. of water and 2 lb. of sodium dichromate. Rinsed with water.[H48]

Oxidation-Reduction Potentials in Sewage

Coli and *aerogenes* in quiescent culture are able to effect a lower oxidation-reduction potential in the medium in the presence of glucose than in its absence. More erratic electrode results are obtained in such culture due to poisoning of the electrodes and to zone effects. The maintenance of aerobic conditions by passing air through the electrode vessel results in much more positive Eh values being obtained, but both organisms can effect reducing conditions in the culture in spite of the presence of an adequate oxygen supply.[C68]

Estimating Coliform Bacteria

Studies of use of different media and methods for determining the coliform bacteria density of raw sewage and chlorinated effluents indicate that confirmations of positive gas former presumptive tests are obtained more often in B.G.B. lactose broth than on E.M.B. agar plates. Comparing the M.P.N. of presumptive and confirmation results, those of the confirmation tests were 94% of the presumptive for raw sewage, 50% for chlorinated sewage.

Use of direct planting in lactose broth gives low results, lauryl sulfate tryptose broth still lower. There does not appear to be any relation between the temperature of the sewage and the results obtained by the different media, although there is between temperature and number of coliform organisms present.

In control of disinfection treatment, adequate information can be obtained by using the presumptive gas former test in lactose broth, particularly for raw sewage, where the concentration of coliform organisms is high, and for chlorinated sewage if chlorination has been complete and the coliform bacteria reduced below 500 per ml. For more accurate results for chlorinated effluents, confirmation in B.G.B. lactose broth seems desirable.[C69]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

C *Sewage Works Journal*

September

64. Applications of Laboratory Data in Plant Control at the Minneapolis-St. Paul Sewage Treatment Works. By K. L. Mick. Pp. 937-952.
65. Plant Operation at Minneapolis-St. Paul. By John C. Sager. Pp. 953-960.
66. Baffle Walls Before Inlets of Travis Hydrolytic Tanks and What They do at Cairo, Egypt. By M. Raef. Pp. 961-963.
67. *t*. The Influence of Nitrifying Flora, Oxygen and Ammonia Supply on the Nitrification of Sewage. By H. Heukelekian. Pp. 964-979.
68. *t*. Oxidation-Reduction Potentials Developed by Pure Cultures in Sewage. By W. Allan Moore, C. C. Ruchhoft and Elsie Wattie. Pp. 980-990.
69. *t*. Estimation of Coliform Bacteria in Raw and Chlorinated Sewage by Means of Different Media. By George E. Symons and Rolland W. Simpson. Pp. 991-999.
70. *t*. Selection of a Dilution Water for the Determination of the B.O.D. of Industrial Wastes. By C. N. Sawyer and A. E. Williamson. Pp. 1,000-1,020.
71. Treatment of Sewage and Sewage Sludge by Electrodialysis. By E. A. Slagle and L. M. Roberts. Pp. 1021-[illegible]
72. An Analysis of Stream Pollution and Stream Standards. By George J. Schroepfer. Pp. 1030-1063.
73. Classification of Inland and Shore Waters. By Warren J. Scott. Pp. 1064-1073.
74. Experience in Separate Sedimentation Tank Operation. A symposium. Pp. 1075-1095.
75. Interesting Extracts from Operation Reports; Greater Winnipeg and District of Columbia. Pp. 1096-1105.

D *The Surveyor*

September 11

25. Decomposition of Sewage. Editorial. P. 309.

September 18

26. Scum Removal from Sedimentation Tanks. By E. J. Hamlin. Pp. 321-322.

E *Engineering News-Record*

October 8

14. Sewage Disposal Designs for Wartime Industrial Plants. By M. H. Klegerman. Pp. 82-85.
15. Treating Pickling Liquors for Removal of Toxic Metals. By George E. Barnes and Matthew M. Braidech. Pp. 86-89.
16. Relation Between Average and Extreme Sewage Flow Rates. By C. Frank Johnson. Pp. 90-91.
17. Something New in Settling Tank Design. By Herbert Moore. Pp. 92-94.

G *Water Works & Sewerage*

October

24. Sludge Digestion at Cleveland, O. By Walter E. Gerdel. Pp. 409-415.
25. The Present Status of Biofiltration. By A. J. Fischer. Pp. 416-425.
26. Teaching Plant Operation to Sanitary Engineers. By George E. Symons. Pp. 445-447.
27. A Pneumatic Grit Washer and Ejector. By Nelson M. Futter. Pp. 449-450.

H *Sewage Works Engineering*

October

48. Wartime Operation Problems at Cleveland's Southerly Plant. By G. E. Flowers. Pp. 493-496.
49. War Damage to Sewerage Systems. By Earl Devendorf and A. F. Dappert. Pp. 497-502, 531.
50. Planning Sewage Works for Post-War Construction. By Seth G. Hess. Pp. 503-506, 530.
51. Sewage Treatment Plants in U. S. A. Pp. 507-508.
52. Conservation of War Materials in Sewerage Design. By C. R. Velzy. Pp. 509-511.
53. Wartime Problems in Sewage Treatment. Pp. 515-518.

J *American City*

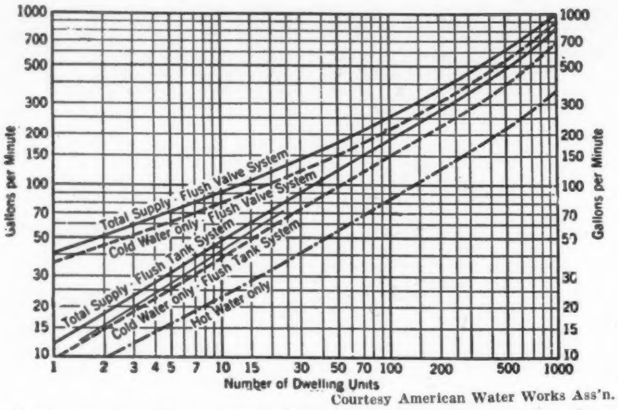
October

12. Sewerage Development in Cleveland. By W. L. Havens. Pp. 42-44.
13. Profits from Sludge (at Grand Rapids, Mich.). Pp. 55-56.

Public Works

October

32. The Operation of Sewage Treatment Plants. Pp. 12-13, 25-68.
33. Operating Sewage Treatment Plants in Westchester Co., N. Y. Pp. 21, 24.
34. Operating Results of the Liberty, N. Y., Biofilter Plant for the Summer of 1942. Pp. 23-24.



Courtesy American Water Works Ass'n.

Maximum momentary demand for domestic water supply; chart originated by Paul Campbell, Federal Public Housing Authority.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Maximum Momentary Demand

The U. S. Housing Authority last year said there was a definite lack of test data on the subject of maximum momentary demand, and prepared a chart to be used for determining water quantity allowances for its housing utilities. (See illustration.) The author of this paper found lots of data, mostly in discussions of metering. He found that generally 15 or 20 gal. was considered ample for one or two families with tank toilets, 35 or 40 gal. with flushometer toilets. In Hartford, Conn., buildings containing 30 to 42 families had peaks little if any greater than 1-family houses, all with flushometers. In Paterson, N. J., the peak for two-family houses was 7 gpm, for one-family 10 gpm. In Indianapolis the peak for a 6-family apartment was 15; 25-family, 30; 73-family, 45; all tank flush; flushometers added about 20 gpm.

The author found that "All figures indicate that a flushometer type of toilet installation demands about twice the water that a tank type does," and that in a multiple-family house or apartment the maximum demand varies only slightly from that of a single family, with rare exceptions.[A135]

Removing Silt From Reservoirs

Of silt brought into reservoirs by streams, the coarse material is deposited as a delta at the head; the fine material may be carried in an underflow and deposited behind the dam. Where this occurs it may be possible to remove it through outlet gates. To do this most effectively, the gates should be small, in several groups, possibly located at different levels; and should be opened during the flood before the silt has had time to settle.[L9*]

High-Speed Water Softening

Teutopolis, Ill., recently installed a softening plant with a capacity of 70 gpm which includes a "spiractor," the first in this country, although several have been built in Europe during the past five years. The well water used, which contains 0.5 ppm of iron and 270 total hardness, passes over several coke trays to a storage tank, float switches in which automatically operate the well pump. The service pump then sends the water through the spiractor, pressure filters and master meter, to the mains. The spiractor is a conical-shaped tank, 4.5 ft. diameter at the top and 11 ft. high, slightly more than half filled with granules (0.1-0.2 mm size) of calcium carbonate catalyst. Raw water enters tangentially at the bottom, mixed with lime suspension, and swirls up through the granular bed, keeping it in suspension. The reaction products are deposited on the individual granules, which are continuously in motion and do not adhere in a mass. When the granules have grown in size as much as is desirable, the largest are drawn off at the bottom and new catalyst added at the top. Hardness is reduced to 76 ppm and iron to 0.1. There is no further decrease in hardness or alkalinity or increase in turbidity of the water after standing 48 hrs. The detention period in the spiractor is 5 to 10 minutes. The sludge is granular and drains to less than 5% moisture content in 24 hrs.[E25]

*See Bibliography in October issue.

Reducing Consumption For Air Conditioning

The Champaign-Urbana, Ill., water utility, like a large percentage of those in the midwest, derives its supply from wells; a surface supply would be difficult and expensive to obtain. Data collected by that company showed that the ground water level had reached 29 ft. in fourteen years; also that in 1941 22% of the total pumpage was for air-conditioning, which uses 3 to 8 gpm of water per equivalent ton of refrigeration. If mechanical condensing units with evaporative condensers were used, 95% of this use would be eliminated.

Water rate for over 30,000 cu. ft. per quarter was 6¢ per 100 cut. ft., while for the first 9,000 cu. ft. the rate was 25¢, and for the next 9,000 cu. ft., 18¢. The only way to cut down the air-conditioning consumption seemed to be to raise the rates, and at the company's request the Illinois Commerce Commission authorized the company to charge the 18¢ rate for all water used for air-conditioning, no matter what the quantity, if the water is used in water-cooled condensers or if water directly from the mains is used as a direct cooling medium in air washers of any type whereby the air comes into direct contact with sprays or wet surfaces or is used as the cooling medium in coils; an extension of time being granted if the consumer finds it impossible to obtain equipment necessary for changing an existing plant.[A131]

Wartime Chemicals

Of chemicals used for coagulation, sulfate of alumina requires aluminum ore and sulfuric acid, both critical. Ferric chloride and chlorinated ferrous sulfate both require chlorine. Of ferrous sulfate with lime, the former is a waste, the latter abundant. Ferric sulfate is presumably a waste material. "Sub-alum" from low-grade bauxite gives highly successful results. (See PUBLIC WORKS for August, p. 38.) Other materials used in water purification are not essential to health, but their absence may drive the consumers to drink other supplies which may not be pure.[A117*]

Critical Materials in Chicago's Filter Plant

Changes in the plans for Chicago's South District filtration plant were made early in 1942 that reduced the use of critical materials by more than 75%, including temporary omission of items not essential to the immediate operation of the plant. Wood window sash was substituted for aluminum or steel, and wood for steel in doors, stairs, laboratory equipment and flag pole. All plaster work on metal lath was temporarily omitted, also several offices,

toilets, etc. A large part of the steam heating piping and boilers was omitted. Asphalt tile flooring was substituted for rubber; heavy roofing felt for copper flashing on copings; also in expansion joints in concrete. The framework of the chemical building and chemical bins were changed from steel to reinforced concrete. All equipment for producing CO_2 was omitted. Light butterfly valves were substituted for gate valves and sluice gates in several places. For rubber-lined steel pipe for handling chlorine solutions, either glass-lined or porcelain pipe are considered. These changes resulted in saving 2,080 tons of steel, 2,558 tons of cast iron, 140 tons of copper, 17 tons of bronze, 162 tons of lead, 10 tons of zinc and 20 tons of rubber.[A120*]

Chemical Building of Chicago's Filter Plant

The chemical building of Chicago's new filtration plant will be the largest chemical building or head house ever designed for a water purification plant. It will be 360 x 60 ft. by 66 ft. high. It will provide for unusually elaborate treatment because the area available was limited and the sedimentation basins must occupy the smallest practicable area, necessitating special chemical treatment to assure effective flocculation and sedimentation. The height provides for overhead storage of chemicals in bins and delivery from them to the feed machines by gravity.

After chemical application, quick and slow mixing and sedimentation, the water passes to 4 batteries of 20 filters each, with a total capacity of 320 mgd., and from these to a storage reservoir.

Bulk chemicals are unloaded by pneumatic conveyor systems. Liquid chemicals flow by gravity to receiving tanks. Elevators lift chemicals in containers to storage rooms above. Bins have steep sides; being reinforced concrete, vibrators were not practicable. Bags of carbon will be dumped into specially ventilated receiving hoppers and flow from these to weigh hoppers that are enclosed and ventilated. Lime, coagulants, ammonium sulfate and carbon will be proportioned by gravimetric dry-feed machines, of which there are 6 lime slakers and feeders and room for 6 more, 6 coagulants and room for 3 more, and 6 ammonium sulfate feeders. Chlorine will be received in ton containers and applied by 14 feed machines with a total capacity of 15,400 lb. per day.[A121*]

Use of Acidified Sodium Silicate

Chicago proposes to use acidified sodium silicate to toughen the coagulant floc in winter. The sodium silicate and sulfuric acid are received in liquid form in tank cars. The former is pumped into 4 large storage tanks and there diluted with an equal volume of water. The acid flows by gravity from the cars into steel tanks and is pumped as needed to the top floor of the chemical building. There are three units of equipment for preparing the sodium silicate, each comprising an acid-holding tank, an acid-weighing tank, an acid diluting tank, a sodium silicate charging tank and two dilution tanks. The sodium silicate is pumped from storage tank to charging tank, the desired quantity measured into the dilution tank and diluted to a concentration of about 1.5% silicon dixoide. Then sulfuric acid will be diluted with 3 times its volume of water and added to the weak silicate solution in the silicate dilution tanks and thoroughly mixed with agitators, aged for 30 min. to 2 hr. and diluted further to contain about 0.6% silicon dioxide; and fed to the raw water by means of constant-level orifice boxes.[A121*]

Chicago Pumping Stations

Chicago's pumping equipment comprises 12 stations which pump an average of 1,000 mgd. with a summer peak of 1,600 mgd., using $1,000,000 worth of electric power and coal a year and costing $360,000 a year to maintain and repair. Some stations are driven by steam engine, some by steam turbine, some by electric motor, some by combination of these. Pump capacities range from 15 mgd. to recent steam turbine units of 80 mgd. normal and 100 mgd. peak capacity. Heads range from 125 to 236 ft. These supply 312 sq. mi. area through 3,851 mi. of 3" to 54" pipe with 412,000 services and 41,400 fire hydrants.

For 17 yrs. a group of engineers known as the "Section of Pumping Station Efficiency" has made regular periodic tests on all pumping station equipment, as well as acceptance tests on new equipment. Periodic testing includes pumps, motors, generators, steam turbines, steam engines, steam generating equipment and boiler auxiliaries.[A123*]

Waterworks Protection In Ohio

Investigation by the Ohio State Dept. of Health of 75 cities and 16 large villages to determine adequacy of protection of their waterworks showed that the outstanding defect was "appalling lack of records." The best records were those of private water companies. In some cities the only maps of the distribution system were those made by the fire underwriters.

Provision of guards by small plants at their own expense was believed impracticable. They should be paid for from some other fund and should be under police supervision.

The protective lighting in many places was ineffective; some merely called attention to vital points and should have been omitted. It was advised that officials get advice of a local electric company on this. Neither lighting nor fencing is effective unless guards are maintained.

Most of the municipalities had furnished inventories of material on hand. Practically none had surplus equipment or material that they could loan without early replacement.

It was found that almost every industry was directly or indirectly connected with the war effort and maintenance of the public water supply was essential to their operation.[A116*]

Hexametaphosphate And Lead Pipe

Investigating the possibility of danger in using sodium hexametaphosphate in lead pipes, the authors conducted some experiments, from which they concluded that: 1—In water having a pH of 7.0 or less, the addition of metaphosphate materially reduces the amount of lead taken up by the water. 2—Under certain conditions, if the water has a pH of 8.8 or more such addition will increase the amount of lead taken up. 3—The amount of lead taken up by the latter is small, and the authors do not consider that it endangers public health, except possibly in softened waters which employ metaphosphate as a substitute for recarbonation.[A124*]

Stabilization of Lime-Softened Water

In 1927 C. P. Hoover advocated recarbonation of softened water and this became standard practice. But developments since then have been extensive and varied. Reviewing the subject again in 1942, Mr. Hoover presents conclusions, including the following: Early lime softening efforts without recarbonation produced water that laid down excessive deposits but did not cause red water. Early recarbonation produced water corrosive to hot water tanks. The treatment plant should protect the consumers' plumbing as well as the mains. When introducing a new softened water supply into an old distribution system, do not publicize date of change-over, and delay recarbonation and use of phosphates for several weeks. Keep well water as free from dissolved oxygen as possible; add lime sufficient to remove magnesium to a minimum, using alum to facilitate this.

There are 7 methods of stabilizing lime-softened water: 1—Long reaction time. 2—Recarbonation. 3—Blending with raw water ahead of filtration. 4—Addition of sodium bicarbonate, soda ash or lime. 5—Sand filtration. 6—Sludge blanket filtration. 7—Use of phosphates such as sodium hexametaphosphate.

Langelier's saturation index theory is questioned by the author. Observations at the Columbus plant indicate

that, with a water of low alkalinity, a high positive saturation index gives best results. The amount of calcium carbonate present as determined by titration is a useful measure of a water's stability; the water should be saturated with it at the pH maintained. Sodium hexametaphosphate softens deposits in cold water lines but does not prevent deposition of calcium scale in hot water tanks; whether it inhibits corrosion in hot water tanks is yet to be determined.

As to the kind of scale produced by different waters, water with pH of 7.2 to 7.5 and high in alkalinity forms a dense protective scale at the temperature of hot water tanks, preventing red water; but in hot water coils, it lays down an excessive amount of dense, hard, adherent calcium carbonate scale. Water with higher pH and low alkalinity produces an extremely heavy coat of chalky scale, high in calcium, magnesium and zinc, in hot water tanks, which protects them satisfactorily unless the water reaches an excessively high temperature. Water high in pH, low in alkalinity, with a low positive index, produces a similar scale but not in sufficient quantity to cover the zinc adequately, so that part of the zinc is converted to zincate, which is easily washed away. Water with a low pH and low alkalinity, when heated in a new galvanized hot water tank, produces a corrosion product that is adherent and protective. It is believed that magnesium in scale causes it to be soft and flaky.[A125*]

Waste Reduction In Pittsburgh, Pa.

Pittsburgh made a pitometer survey in 1929-1932 of 65% of its main mileage, which made it possible to reduce pumpage from 111.2 mgd. to 89.6 mgd., the reduction including 7.6 mgd. underground leakage, 11.1 house waste, 0.7 under-registration of industrial meters. In 1939 the remaining 35% of the mains was served. In 1940-42 the 65% was resurveyed and showed 4.9 underground leakage, 3.3 house waste and 0.1 under-registration of meters. The underground leakage had developed in ten years. Reduction of house waste by 70% was due to increasing metering of services from 40% to 66%, and house inspections. The annual saving in operating costs made possible by the pitometer survey is more than $180,000—nearly 100% annually of the expenditure for the waste prevention work. It is planned to make a continuous survey of the pipe lines, section by section, so that every pipe line will be tested every few years.[F94]

Gatemen in San Francisco

Of the 140 men in the operating division of San Francisco's water department, eight, known as gatemen, are the only ones allowed to operate the gates on the 988 miles of 2" to 6" distributing mains. One of these is always on duty, in three 8-hr. shifts; the other five are on the regular day shift. The one on duty responds to all calls outside of regular working hours and to emergency calls during working hours. When on the job, he takes care of the trouble himself if he can, calls out a service or main-pipe crew if necessary, or lets the leak run until regular working hours if no damage will result. The regular day shift shuts valves for work gangs, blows off dirty water, attends to complaints, and keeps the yard clean in spare time.

A record is kept of all gates operated and each gateman reports any valve he finds to be not in good working order. Each has a combined pipe and gate book which he must keep up to date, maps being 5 by 9¼ inches, 400 ft. to the inch, reductions from large maps made on an offset press.[F95]

Water a Critical Material

In many districts the available water supply is beginning to show signs of failure to meet the demands being made upon it, especially ground water supplies. No new wells should be sunk unless absolutely necessary. Unnecessary uses may have to be curtailed—air conditioning, lawn sprinkling, street flushing. In some districts it may have to be allocated. Use of critical materials for extending service should be minimized; use existing plant to the best advantage, including even obsolete equipment. Priorities will not be granted to permit maintaining pressures during ridiculously high maximum hourly demand peaks.G43

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c, Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

A *Journal, American Water Works Ass'n*
October

126. Good Practice in Waterworks Management. By Wendell R. La Due. Pp. 1483-1488.
127. Sound Management and the Qualifications of a Good Superintendent. By Dale L. Maffitt. Pp. 1489-1495.
128. Jonesboro's Water Works—A Successful Business. By Lloyd M. Rebsamen. Pp. 1496-1502.
129. The Omaha Water Works—A Successful Business. By Walter S. Byrne. Pp. 1503-1510.
130. War and Water Rates. By Reeves Newsom. Pp. 1511-1515.
131. Promoting Conservation of Water by Rate Surcharges By Frank C. Amsbary, Jr. Pp. 1516-1522.
132. Water Waste Prevention and Correction in Pittsburgh. By Homer E. Beckwith. Pp. 1523-1526.
133. Survey of Billing and Collection Practices of Cities of 100,000-200,000 Population. By George F. Hughes. Pp. 1527-1532.
134. How an Examiner Looks at the Water Works. By Frank B. Thomas. Pp. 1533-1537.
135. Studies on Maximum Momentary Demand. By A. P. Kuranz. Pp. 1538-1544.
136. Methods of Handling Street Excavations. By D. D. Gross. Pp. 1545-1551.
137. Good and Bad Practices in Tank Maintenance. By Walker B. Davis. Pp. 1552-1558.
138. Identification of Micro-Organisms in Relation to Water Purification. By James B. Lackey. Pp. 1559-1568.

D *The Surveyor*
September 18

2. Inspection and Testing of Fire Hydrants. P. 320.

E *Engineering News-Record*
September 24

25. High-Speed Water Softening Process Makes Its Municipal Debut. By Alex Van Praag, Jr. Pp. 92-94.

October 8

26. Strategy and Tactics on a Wartime Waterworks Project. By Edward J. Cleary. Pp. 64-68.

F *Water Works Engineering*
September 23

92. Water Conditioning at Lansing, Mich. By Nathan N. Wolpert. Pp. 1142-1145, 1163.
93. History of Chlorine Treatment. Pp. 1156-1158.

October 7

94. Waste Prevention Experience in Pittsburgh, Pa. By James H. Kennon. Pp. 1196-1198.
95. Distribution Practices in San Francisco, Calif. By George W. Pracy. Pp. 1199-1201.
96. Sodium Hexametaphosphate Tested for Corrosion Control. By Rolf Eliassen and Reginald J. Sutherland. Pp. 1202-1205.
97. How New Bedford, Mass., Protects Its Water Supply. By Howard C. Mandell. Pp. 1216, 1224.

G *Water Works & Sewerage*
October

43. *p*. Water—A Critical War Material. By Arthur E. Gorman. Pp. 431-432.
44. The Bourne Water District of Monument Beach, Mass. By Chas. J. Crump. Pp. 434-437.
45. *p*. Good and Bad Practices in Tank Maintenance. By Walker B. Davis. Pp. 438-440.

L *Civil Engineering*
October

10. New Gaging Station for Mountain Streams. By H. G. Wilm. Pp. 548-549.

M *Water and Sewage*
September

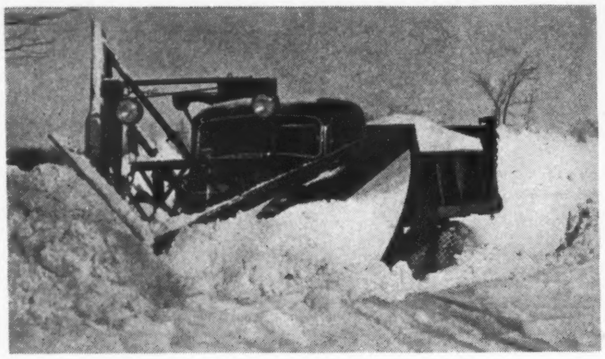
25. Dominion Government Assumes Authority Over All Municipal Water Supplies. Pp. 15-16.
26. How to Handle the Algae Problem. By A. E. Berry. Pp. 17-20, 38.
27. Plastics Invade the Waterworks Field. Pp. 22-23, 44.

P *Public Works*
October

38. Fundamentals for Designing Low Dams: Earth Dams. Pp. 14-16, 68-70.
39. *n*. Lubrication of Under-Water Bearings. P. 18.
40. *c*. Constructing the La Grande Reservoir. By E. H. Ford. Pp. 19-20.

W *Johnson National Drillers Journal*
September-October

9. Hydraulics of Wells. Pp. 1-7.
10. Measure Your Wells Now. Pp. 12-13.



Road Experiments on the Design of Thin Bituminous Surfacings

Conclusions to date of a test road laid in England in 1939

Thin bituminous surfacings or bituminous carpets ¾-in. to 1-in. thick are now widely used in place of more expensive materials defined by British Standard Specifications, as a means of restoring the riding quality of road surfaces. In order to establish the correct principles of design for this type of surfacing, and to confirm laboratory investigations, an extensive series of bituminous carpets were laid in 1939 on the Colnbrook by-pass by the Road Research Laboratory of the Department of Scientific and Industrial Research, in cooperation with the Ministry of Transport. After exposure to traffic and weather for two years, which included one unusually severe winter, it is possible to draw conclusions as to the limits of composition beyond which durable carpets will not be obtained. The exact limits of the most successful carpets will not be known until the experiment is concluded, but the compositions are indicated of those carpets which so far appear most satisfactory as regards durability and texture.

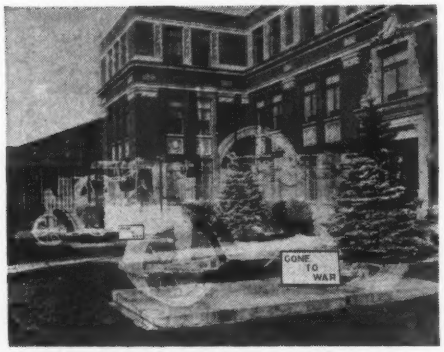
The carpet materials were produced by mixing together coarse aggregate, fine aggregate, filler, and binder; and the experiments are concerned with the way in which the performance of the carpets on the road is affected by variations in the nature and proportions of these constituents.

The present conclusions may be summarized as follows: 1. By choosing suitable proportions of fine aggregate and binder, good results on heavily-trafficked roads can be obtained from ¾-in. carpets made with either granite or gravel aggregate and bitumen or tar binder. 2. The combination of coarse aggregate, sand, filler, and binder giving the *most* satisfactory results in each series is: (a) ½-in. granite and bitumen: 5-15 per cent of sand, 0-6 per cent of filler, and 4-5½ per cent of 300 pen. bitumen (9¼-10½ gal. per ton of aggregate); (b) ½-in. granite and tar: 15-25 per cent of sand, 4-6 per cent of filler, and 5.2-5.8 per cent of tar No. 1 or No. 2 (10½-11¼ gal. per ton), or 5.7-6.3 per cent of tar No. 3 (11¼-12½ gal. per ton); (c) ½-in gravel and bitumen: 10-20 per cent of sand, 4-8 per cent of filler, and 4½-5 per cent of 300-pen. bitumen (10½-11¼ gal. per ton); (d) ½-in. gravel and tar: 23-27 per cent of sand, 4-8 per cent of filler, and 5½-6 per cent of tar No. 1 or No. 2 (11-12 gal. per ton), or 6-6½ per cent of tar No. 3 (12-13 gal. per ton). 3. Granite aggregate is preferable to gravel, since greater latitude is possible in selecting the grading of aggregate necessary to produce a durable carpet. 4. Both granite and gravel aggregate can be used over a wider range of grading with bitumen than with tar. 5. The carpets containing the three tar binders show no outstanding difference in road performance. No noticeable alteration in behavior has been produced by the addition of 5 per cent of bitumen to a blended tar. 6. For the same grading of aggregate, gravel carpets require more binder than granite carpets, the increase being about 0.5 per cent in the medium-textured carpets. 7. The incorporation of filler in the mix is not essential, although for a given binder-content it has improved the durability of certain carpets—particularly those with gravel aggregate. 8. For the same aggregate composition, more binder is desirable in open-textured carpets on lightly-trafficked roads than for those on heavily-trafficked roads.

Abstract of a paper by Robert Slater before the Institute of Civil Engineers.

DIRECTORY OF CONSULTING ENGINEERS

Keeping Up With New Equipment



The cloudlike illusion of two "ancient" rollers recently sacrificed to the war effort was obtained by double printing photography to show how they formerly appeared at The Austin-Western Road Machinery Co. Plant.

Antiquated Rollers "Join Up"

Austin-Western Road Machinery Co. Aurora, Ill.

The imaginary rollers you see in phantom, resting on the two concrete, foundation pedestals, are merely representations of machines that were once on display at the entrance of The Austin-Western Road Machinery Co's. general offices. Each of these 20,000 pound units have "GONE TO WAR" and now are doing their bit to help Uncle Sam's blast furnaces turn out the stuff that will beat the enemy.

Both machines were of historic significance. One was brought over from Ireland for experimental purposes and the other was the first motor roller made in America. Each was a one-cylinder relic of earlier road building days, and being of interest to visitors, was suitably marked with a heavy bronze plaque.

The machines were regarded with sentimental attachment by the Austin-Western organization and though they regretted to see the units go into the salvage heap, they nevertheless were glad to contribute them to the war effort as a means of bringing about early victory.

Gale Liquid Interceptor and Conditioner Recovers Grease and Prevents It From Entering Sewers

Gale Oil Separator Co., Inc.
405 Lexington Ave., New York, N. Y.

When the liquid mixture (such as, oils, greases, fats, gasoline, solvents, and water) flows into the interceptor and conditioner, immediately, this mixture is subjected to separating impulses by being directed downwardly and to the sides of the interceptor.

This incoming current is further broken apart by a specially designed and engineered breaker, which causes the oils, greases, gasoline, solvents, and fats to immediately float to the surface. The heavier water, grit and dirt is directed downward, scrubbed, rolled, and rubbed over the washboard bottom of the interceptor and conditioner, which further removes any oils, greases, gasoline, or fats that may be clinging to this material.

These oils, greases, solvents, gasoline, and fats flow to the surface in the larger chamber and are collected on the top with the previously separated oils, fats, greases, solvents and gasoline. These accumulated liquid materials flow out of the conditioner, by gravity, over a skimmer dam into a container placed alongside the conditioner.

After the heavier water, grit, and dirt have been thoroughly scrubbed, it flows downwardly to the bottom of the conditioner. The grit and dirt is collected in a removable sediment bucket, and the clarified water flows out into the sewer by gravity.

A folder is available describing and illustrating the Interceptor and another on Profits from Waste Fluids will be sent on request.

Rototiller Road Maker

Rototiller, Inc., Troy, N. Y.

Especially built for mixing oil or cement in sand or soil in a thorough manner. These machines are used for building highways, streets, airports, and other areas with either soil and cement, or for oil stabilization. A Rototiller road maker is easily attached to and drawn by any make of tractor. Its mechanism is powered with a 95 h.p. Chrysler industrial motor. The strong self-sharpening spring tines are revolved at high speed. Each tine ploughs through a small amount of soil or sand at this high speed, completely pulverizing and mixing the soil and cement, instead of shearing chunks as do the slow speed plow, disc and harrow. It will do a mixing job in average soil down as deep as 12 inches, and in light friable earth down to 18 inches. The manufacturers claim that it has proven thoroughly satisfactory, for in place mixing of cement or soil in the building of highways, streets, airports and other areas.

It is ruggedly built of high grade alloy metals. All controls are located for one man operation, hydraulic lift is used for lowering and raising tilling unit. A 4 speed transmission permits use of this machine under varying conditions even to doing scarifying work. These machines were used in building the military airports at Camp Devon, Westover Field, Presque Island, Brunswick, Maine, etc.

The Rototiller road maker has a 6 foot cut and operates at any speed permitted by the work to be done.

Write for folder giving complete description.

Asphalt Institute Recommends Specifications to Meet Prevailing Conditions

Commending the flexible pavement construction specifications developed jointly by the Army's Corps of Engineers, Civil Aeronautics Administration and the Public Roads Administration, the Asphalt Institute has issued a timely publication, Information Series No. 49, "Transportation Shortages Affect Asphalt Pavement Design," in which it shows how *redesign* of pavement structures may be made without sacrificing the advantages inherent in normal asphalt construction procedure.

Included also in this publication are the jointly developed specifications above referred to, entitled "Specifications for Constructing Mechanically Stabilized and Prime Coated Sub-Base for Asphalt Pavements or Surface Treatments."

Copies of this new number in the Information Series are available without charge upon request to the Asphalt Institute, 801 Second Avenue, New York, N. Y.

The Enslow Stability Indicator

Phipps & Bird, Inc., Richmond, Va.

The purpose is to simplify the Marble-Test, making it dependable and non-time consuming.

Two outstanding features of the device are, a constant head tank and a specially designed calcium carbonate contact chamber, which holds a charge of precipitated chalk.

Water flows through the Indicator continuously. It enters the constant head tank without turbulence, thence flows through a tube which extends downward to the bottom of the calcium carbonate chamber. The shape of this vessel produces a tapered velocity of upward flow to float the chalk "blanket," thus affording effective distribution, and intimate contact between water and chalk without danger of sweeping out the light chalk. In this respect it resembles the well known conical shaped Spaulding Precipitator. As the water passes from the top of the chamber, it flows downward through the primary trap tube containing No. 2 calcite sand. Thence, upward through the secondary tube which is filled with No. 1450 grade calcite sand which serves as a trap and decollodizing unit. The completely stabilized effluent from this secondary tube flows to a 2-way cock which permits it to be run into a sampling flask or to waste in any quantity from a mere dribble to a constant stream.

For more detailed description and Test Procedure, write the manufacturers.

Crystalite Now Used for Reagent Heads

Transparent Crystalite moldings, which permanently withstand chemical solutions, and at the same time permit full visibility of vital working parts, are now being used for sight feeders and reagent heads on Chlor-O-Feeders, Chem-O-Feeders and other water purification equipment manufactured by Proportioneers, Inc. Hypochlorite solution, soda ash and alum are among the chemicals to which the plastic heads have demonstrated complete resistance with no loss of transparency. In addition to chemical resistance and visibility, the injection molded Crystalite parts are permanently able to withstand hard knocks and shocks.

American Road Builders' Association Official Nominations

The nominating committee has submitted the following nominations for officers of the American Road Builders Association for the year 1943, and for directors for three years:

For president: C. W. Brown—Chief Engineer, Missouri State Highway Department, Jefferson City, Mo.

For Vice-Presidents: Paul B. Reinhold—President, Reinhold & Co., Inc., Pittsburgh, Pa. Charles W. Smith—President, Smith Engineering & Construction Co., Pensacola, Fla. Lion Gardiner—Vice-President, Jaeger Machine Company, Columbus, Ohio. Robert A. Allen—State Highway Engineer, Carson City, Nev.

For Treasurer: H. C. Whitehurst—Director of Highways, District of Columbia, Washington, D. C.

For Directors, term ending 1946: R. H. Baldock—State Highway Engineer, Salem, Ore. Robert B. Brooks—Consulting Engineer, St. Louis, Mo. J. F. Cast—Manufacturers' Sales Manager, Firestone Tire & Rubber Co., Akron, Ohio. Paul L. Griffiths—Vice-President, Koppers Co., Pittsburgh, Pa. W. R. Macatee—Managing Director, The Asphalt Institute, New York, N. Y. A. E. O'Brien — Secretary, Associated Pennsylvania Constructors, Harrisburg, Pa. Nello L. Teer— Contractor, Durham, N. C.

Universal Crusher Company Changes Name October 1, 1942

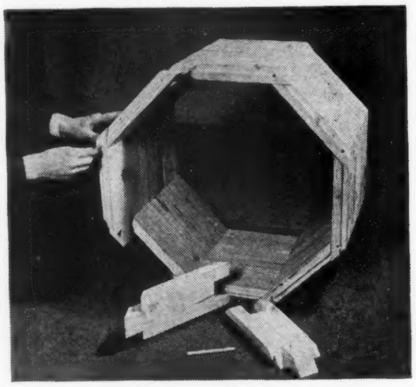
The Universal Crusher Company, a Delaware corporation, with factories and general offices at Cedar Rapids, Iowa, on October 1, 1942 has become the Universal Engineering Company, organized under the laws of Iowa.

The Universal Crusher Company was founded in 1908 and is credited with being the first manufacturer in the United States of overhead eccentric jaw crushers.

Practically all that will be changed is the name. The officers, executives and personnel remain the same.

It was felt that the new corporate name is more comprehensive, and will be in keeping with the activities which

include the design, engineering and manufacture of rock and ore crushers, portable crushing plants and road machinery, precision instruments and units for aircraft and ordnance requirements.



Armco Emergency Pipe.

Report on "Strength Research on ARMCO Emergency Wood Pipe"

Armco Drainage Products Assn.,
Middletown, Ohio

The results of extensive field and laboratory tests on twenty different sizes and shapes of wood pipes and conduits have been published in a 43-page illustrated report issued in a limited edition.

The purpose of the investigation was to determine the structural behavior of a new type of wood pipe and the "pipe-arch" developed by that Association as a substitute for metal pipe during the period of steel conservation. The new pipe, known as ARMCO Emergency Wood Pipe, consists of a series of inter-connected polygonal shaped rings, each side of which is a pre-fabricated segment, the ends of which are mortised and doweled together so as to form a semi-flexible hinged corner.

Asphalt Institute Issues Specification for Sand Asphalt Road-Mix Course

A specification covering the construction of a Sand-Asphalt road-mix course on natural sand subgrade has been adopted by the Asphalt Institute and promulgated as its "Specification RM-3."

Copies are available, without charge, upon request to the Asphalt Institute, 801 Second Avenue, New York, N. Y.

NoDrip, Plastic Cork Coating, Stops Dripping From Condensation on Pipes, Tanks, etc.

J. W. Mortell Co.
Kankakee, Ill.

The manufacturers say: NoDrip is a black, heavy-bodied plastic compound similar in consistency to plasterer's mortar. It is odorless, non-toxic, vermin proof; highly resistant to brine, acid and alkali; NoDrip is not inflammable while wet and will not propagate fire when dry.

Its ease of application together with the fact that it forms a sealed waterproof coating without seams or joints, distinguishes it from the conventional type of thermal insulating material. The insulating value of NoDrip remains constant because it does not absorb or soak up water when exposed to humid conditions.

Literature available includes instructions for application, prices, etc.

Sand-Asphalt Construction Specification Issued by Asphalt Institute

A specification covering the construction of the hot-mix type of Sand-Asphalt base and surface courses has been adopted by the Asphalt Institute and promulgated as its "Specification A-5."

Copies are available, without charge, upon request to the Asphalt Institute, 801 Second Avenue, New York, N. Y.

NEW APPOINTMENTS

City and County Officials recently appointed:

City Engineers

George T. Oliver, Emeryville, Calif.
Roy E. Vinyard, Benton, Ill.
R E. Monson, South St. Paul, Minn.
E. T. Hale, Boonville, Mo.
Oscar Schilling, Kent, Ohio.
Walter J, Zimmerman, Punxsutawney, Pa.
S. A. Russell, Bay City, Tex.
Norman J. Salmon, Aberdeen, Wash.
O. H. Robinson, Park Falls, Wis.

City Managers

C. V. Jones, Albert Lea, Minn.
Charles H. Brown, Jr, Niagara Falls, N. Y.
William A. Walsh, Yonkers, N. Y.
A. A. Meredith, Borger, Tex.

Public Works Directors

Harry C. Vansano, San Francisco, Calif.
T. C. Kirkman, High Point, N. C.
Sam Neeck, Park Falls, Wis.

Water Works Superintendents

Arthur Taylor, Beverly Hills, Calif.
Kenneth H. Fry, Hayward, Calif.
Dave A. Hendrix, Petaluna, Calif.
W. K. Adams, Redding, Calif.
Ralph Elsman, San Jose, Calif.
M. W. Brown, Orlando, Fla.
E. P. Hendricks, Cairo, Ga.
Boyd Case, Edwardsville, Ill.
Lynn O. Minor, Kankakee, Ill.
H. J. Lloyd, Connersville, Ind.
Melvin Mallory, Crawfordsville, Ind.
J. V. Willetts, Elwood, Ind.
Dwight W. Edwards, Iowa City, Iowa.
Harry Brillhart, Framingham, Mass.
Patrick J. Lucey, Holyoke, Mass.
M. H. Goff, Milford, Mass.
Chas. W. Miller, Butler, Mo.
Fred K. Vance, Carthage, Mo.
T. H. Pollock, Plattsmouth, Nebr.
Alonza Shinn, Burlington, N. J.
John Bell, Tarboro, N. C.
Geo. D. Keyser, Salt Lake City, Utah.

County Engineers

Chris. H. Ostermeier, Hancock Co., Greenfield, Ind.
George F. Gault, Wayne Co., Richmond, Ind.
George W. Wood, Ringold Co., Mt. Ayr, Iowa.
L. L. Boggess, Clarke Co., Osceola, Iowa.
Walter V. Thomas, Leavenworth Co., Leavenworth, Kan.
Verdis I. Brown, Rice Co., Lyons, Kan.
Garnett Dansdell, Mercer Co., Harrodsburg, Ky.
W. E. Burgess, Douglas Co. (Acting), Alexandria, Minn.
J. A. McCauley, Marshall Co., Winborn, Miss.
Charles M. Gordon, Brown Co. (Acting), Georgetown, Ohio.
Robert E. Willis, Fayette Co., Washington C. H., Ohio.
F. J. McLaughlin, El Paso Co., El Paso, Tex.
Robert C. Mills, Pacific Co., South Bend, Wash.

Dwight Powell Is Captain in Corps of Engineers

Dwight E. Powell, who for the past 17 years has been employed by Tillman County and the City of Frederick, Okla., as County and City Engineer, took leave of absence July 13th to enter the army as Captain in the Corps of

Engineers. He is now Assistant Post Engineer, New Orleans Port of Embarkation, in charge of repairs and utilities, at the Station Hospital, Harahan, La.

Morse, Jr., Dodge and Elmburg Advanced by Fairbanks, Morse.

Robert H. Morse, Jr., who has been branch manager successively of the offices at Cincinnati, Dallas and Boston, has recently been made Assistant Sales Manager with Mr. A. C. Dodge, Vice President and Sales Manager, Fairbanks, Morse & Company, Chicago, Illinois.

John Elmburg, formerly Manager of the Diesel Engine Department at St. Paul, Minnesota, has been made Manager of the Boston Branch to fill the vacancy left by Mr. Morse.

Conventions and Association Meetings

Dec. 1-4—Highway Research Board, 22nd Annual Meeting, Hotel Statler, St. Louis, Mo.

Nov. 30-Dec. 1—Association of Asphalt Paving Technologists, Hotel Statler, St. Louis, Mo.

Dec. 7-9—American Assn. of State Highway Officials, Hotel Statler, St. Louis, Mo.

WAR EMERGENCY

(Continued from page 7)

Sanitary Engineers Wanted by Office of Surgeon General

Sanitary engineers are wanted for war service, and will be appointed as First Lieutenant if having the following qualifications: At least 4 years' actual experience in sanitary and public health engineering, including two of the following specialized activities: mosquito control, rodent control, water supply, sewage treatment; said experience acquired in the employ of a city, county or state health department, the U. S. Public Health Service, a manufacturer or dealer who furnishes equipment or supplies for these activities, an engineering firm or other agency specializing in one or more of these activities, or an approved college or university. Must be competent to assist and advise in the formation and execution of a mosquito or rodent control program and/or in the operation of water supply and sewage treatment plants.

Must have completed a 4-year course and received Bachelor's degree in civil or sanitary engineering from an approved college or university. A Master's degree in sanitary engineering may be substituted for 1½ years of experience outlined above.

Procedure for Use of Bituminous Materials

Recommendation No. 45 issued by the Petroleum Coordinator for War on April 24, 1942, restricted the use of asphalt and tar on highways in 17 Atlantic Seaboard States to those projects certified by the Public Roads Administration of the Federal Works Agency as necessary to the successful prosecution of the war. Control was extended as far west as the Rocky Mountains by action taken on July 2. On October 5 restrictions were made effective in all States.

The procedure to be followed by State, county, city and local highway officials in making application for bituminous materials for use on public highways is a simple one. Application is made on a self-explanatory form available from State highway departments and offices of the Public Roads Administration. The application should be sent to the State highway department which makes its recommendation as to the war necessity of the work and forwards it to the district office of the Public Roads Administration. Final action is taken in the Washington headquarters on all applications except those originating in States under the western regional office, which are acted upon in the San Francisco regional office.

When an application is approved as essential to the war effort, a certificate is forwarded to the applicant that may be used as authority to purchase a stated amount of material.

Since the initiation of control over

bituminous materials, a number of cases have arisen that do not fall in the above category and methods of handling have been agreed upon by the office of the Petroleum Coordinator for War and the Public Roads Administration.

Jurisdiction of Public Roads Administration—It has been agreed that public roads, streets, highways, driveways or public parkways which come under the jurisdiction of the Public Roads Administration shall include, in general, all roads outside of areas under the control of the Army or Navy and outside of manufacturing plants. The Director of Marketing, Office of Petroleum Coordinator for War, will pass on applications for bituminous road materials for use in manufacturing plants or in areas under the control of the Army or Navy.

Applications for materials for use in areas outside the jurisdiction of the Public Roads Administration should be made to the Director of Marketing, Office of Petroleum Coordinator for War, Washington, D.C.

Natural rock asphalt—The Office of Petroleum Coordinator has ruled that the use of natural rock asphalt is not restricted by the provisions of Recommendation No. 45. Therefore, it is not necessary to make application for certificates of necessity of use of natural rock asphalt *as such*.

Bituminous joint fillers — Premolded bituminous joint fillers are not restricted by Recommendation No. 45 but *poured* bituminous fillers do come under the restrictions and require certification.

Maintenance materials for public utility companies—Since it is impracticable to require that municipalities submit applications for the bituminous materials needed by public utility companies for the repair and maintenance work that they are required to perform on public streets and highways, the following modification has been made in the published procedure:

An application for bituminous road materials needed by a public utility company for maintenance work on public highways and public streets may be submitted by an authorized official of the company. A public utility company, such as a street railway company, or a gas, water or electric company, may submit an application for the materials needed on its entire system during a calendar year.

Blackout and Camouflage Paints

New Government standard specifications have been established for the manufacture of blackout, luminous, and camouflage paints. Nine colors have been selected for paints used in general camouflage to conceal and protect factories, arsenals, and other such objectives in this country. The Bureau of Mines is now conducting a survey to determine available sources of minerals essential in the preparation of these paints.

Plans for Post-War Public Work

Brigadier General Philip B. Fleming, Federal Works Administrator, has announced that engineering work is actually under way on a projected highway building program to cost nearly $500,000,000. The engineering is being financed from a special $10,000,000 fund authorized by Congress. The Federal Works Agency has approved projects for post-war construction which include highways totaling 100 miles in Missouri, 75 in California, 68 in Massachusetts, 49 in Oregon, 45 in New York, 36 in New Jersey and 34 in Mississippi.

Rental Prices for Construction Equipment

An amendment to the OPA regulation controlling rental prices for construction equipment has been issued, effective on October 22. The major changes made by this amendment, as they apply to highway and similar work, are:

1. The rate schedule has been clarified and extended explicitly to cover fractional weekly and monthly rental periods. Also, a method for establishing maximum rentals on a "per hour" basis is included.

2. Maximum rentals for additional items of equipment, such as air receivers, backfillers, suction hose, finegraders, belt loaders, bituminous mixers and pipe-layers have been added to the list of individual items for which dollars-and-cents maximums are provided. The list of types and sizes of different kinds of equipment given dollar-and-cents maximum rentals has been doubled to cover more than 1,000 different items.

3. Charges for related rentals and services which formerly were covered by other regulations now come under Regulation No. 134, as amended.

The new schedule increases the rates for some equipment as high as 25 per cent while others have been reduced as much as 20 per cent. Rates for power shovels have been increased approximately 10 per cent and for concrete finishing machinery 25 per cent. On the other hand, rates for air compressors have been reduced approximately 20 per cent.

Water a Critical Material

In the hope of conserving 10,000,000 gallons of tap-water a day—and thus save 900 tons of coal at the pumping stations—the London (England) Metropolitan Water Board has asked housewives to save rain water.

Water is becoming a critical material in some parts of this country also. Several cities have had to restrict the use of it for air conditioning, lawn sprinkling, street flushing and others not absolutely necessary. Even though the amount of water at the source is not limited, it may be necessary to conserve the fuel used for pumping it, or the mains may not have capacity for carrying, with adequate head, more than a limited amount. Priorities will not be granted for materials to permit maintaining pressure during unnecessarily high maximum hourly demand peaks.

Readers' Service Department

These booklets are FREE but distribution is restricted to those actively engaged in engineering or construction. Use the coupon below or write the manufacturer direct, mentioning PUBLIC WORKS.

Construction Materials and Equipment

Air Raid Shelters

3. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

Asphaltic Limestone

5. Characteristics, methods of laying, and results with cold lay mixture shipped ready to use. Especially adapted to resurfacing old pavements, sealcoats and airport runways. Alabama Asphaltic Limestone Co., Liberty Nat. Life Bldg., Birmingham, Ala.

Bridges

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Inc., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

8. Lt.-weight, non-skid, mineral surfaced asphalt planks for any type bridge. Write for latest catalog. Servicised Products Corp., 6051 West 65th St., Chicago, Ill.

Cement Dispersion

9. "Economics of Cement Dispersion and Pozzolith" tells the complete story of how cement dispersion reduces water required up to 20% and increases workability 150%. Write The Master Builders Co., Cleveland, Ohio, for a copy.

10. A valuable treatise on available means of securing high strength, prevention of sealing, increased durability and improved wear resistance in concrete pavement construction. Master Builders Co., 7016 Euclid Ave., Cleveland, Ohio.

Cement, Early Strength

11. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit, Mich.

Cold Mix Plants

15. New catalog and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus, Ohio.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

33. Pocket manual of concrete curing with calcium chloride. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

73. "Principles of Design of Airport Drainage" and other articles on airport drainage reprinted from PUBLIC WORKS Magazine are being distributed free by Bowerston Shale Co., Bowerston, O., Hancock Brick & Tile Co., Findlay, O., and Columbus Clay Mfg. Co., Blacklick, O. Address anyone of the above for a copy.

Graders, Patrol

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Oil

109. Ring-Free Motor Oil that keeps motors clean and free from carbon, and reduces frequency of overhauls is described in literature available from Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

Pumps

120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester, N. Y.

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Road Building and Maintenance

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

Rotproofing

145. Cuprinol, a rotproofing chemical that protects wood from fungi and insects, yet has no offensive odor, is non-poisonous, does not corrode metal and can be painted over. Get full details in booklet from Cuprinol, Inc., 7 Water St., Boston, Mass.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

154. "Soil Stabilization with Tarvia" —An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

USE THIS COUPON

Readers' Service Dept., PUBLIC WORKS 11-42
310 East 45th St., NEW YORK

Please send me without obligation the following booklets listed in your READERS'

SERVICE SECTION ....
(indicate by numbers)

Name ....

Occupation ....

Street ....

City.............................. State..............................

Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus, Ohio.

Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit, Mich., for Bulletin No. 29.

Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

Street and Paving Maintenance

190. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. Tnese are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati, O.

198. Illustrated Bulletins 15 to 20 describe Mohawk Oil Burning Torches; "Hotstuf" Tar and Asphalt Heaters; Portable Trailer Tool Boxes; Pouring Pots and other equipment for street and highway maintenance, roofing, pipe coating, water proofing, etc. Mohawk Asphalt Heater Co., Frankfort, N. Y.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Co., Wyandotte, Mich., tells how to use calcium chloride for modern ice control.

Sanitary Engineering

Aero-Filter

356. "Results Produced by Aero-Filters" is a new pamphlet covering results at Temple, Texas; Paris, Ill.; Webster City, Iowa; and Mason, Mich. Write Lakeside Engineering Corp., 222 West Adams St., Chicago, Ill.

Air Release Valves

357. Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.

Analysis of Water

360. "Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Activation and Aeration

376. A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.

377. Activated Sludge Treatment. Five booklets are available covering Stationary Diffuser Tubes, the Swing Diffuser, the Mechanical Aerator and the Combination Aerator and Clarifier. Operation of activated sludge plants. Chicago Pump Co., 2336 Wolfram St., Chicago, Ill.

Chlorinators, Portable

380. Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark, N. J.

381. "Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers, Inc., 96 Codding St., Providence, R. I.

Cleaning Mains

382. "Let's Look Into the Matter of Water Main Cleaning" is an illustrated booklet outlining the advantages of water main cleaning and explains how it can be done quickly and inexpensively by The National Method. Write National Water Main Cleaning Co., 30 Church St., New York, N. Y.

Cleaning Sewers With Own Forces

383. A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.

Consulting Engineers

385. "Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.

Feeders, Chlorine, Amonia and Chemical

387. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.

Filters

388. Anthrafilt for increasing filter capacity without adding filters. For full details write H. G. Turner, State College, Pa.

Fire Hydrants

390. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.

391. See listing No. 410.

Flow Meters

392. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Gas Holders and Digesters

393. Clarifiers, sludge digesters and other tanks and gas holders for sludge gas. Graver Tank & Mfg. Co., Inc., East Chicago, Ind.

Gates, Valves, Hydrants

394. Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Lubricants

401. Lubricants. "Lubriplate," a combined lubricant and protection against corrosion, especially effective for parts immersed in sewage. An 8-page folder. Fiske Brothers Refining Co., Newark, N. J.

Laboratory Equipment

402. Acid-proof sinks, pipes, ventilating and other equipment. Maurice A. Knight, Akron, Ohio.

403. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore, Md.

Manhole Covers and Inlets

405. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

Meters, Venturi

406. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

Mixers, Chemical

407. Chemical Mixers. "Slo-Mixers" for multi-stage flocculation described and illustrated in 6-page bulletin No. 389. Chain Belt Co., 1663 W. Bruce St., Milwaukee, Wis.

Pipe, Cast Iron

408. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York, N. Y.

409. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLavaud centrifugally-cast and pit-cast pipe. Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Burlington, N. J.

410. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa.

Pipe, Transite

414. Two new illustrated booklets, "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

Pipe Joints, Sewer

415. How to make a perfect sewer pipe joint—tight, prevents roots entering sewer, keeps lengths perfectly aligned; can be laid with water in trench or pipe. General instructions issued by L. A. Weston, Adams, Mass.

Pipe, 2-inch Cast Iron

417. Generously illustrated booklet describes McWane 2-inch cast iron pipe and its manufacture in streamlined pipe shop. Write McWane Cast Iron Pipe Co., Birmingham, Ala.

Protection for Plants

419. Protecting sewage plants against disintegration. What to use and where to use it. Complete data with labels. Inertol Co., Inc., 470 Frelinghuysen Ave., Newark, N. J.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

Meter Setting and Testing

430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

Reservoirs, Concrete

431. Data on how large reservoirs may be built at a saving as units by the Wm. S. Hewett System of reinforced concrete construction will be sent without obligation. The Wm. S. Hewett System, 20 N. Wacker Dr., Chicago, Ill.

Screens

434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.

Sludge Drying and Incineration

440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 48 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 4809-15 Tod Ave., East Chicago, Ind. Write for a copy of this instructive folder.

Sprinkling Filters

445. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

Swimming Pools

446. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

451. Powdered Hydrodarco for taste and odor control. For complete data on its use write Darco Corp., 60 East 42nd St., New York, N. Y.

Treatment

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill.

454. A full line of equipment for sewage disposal including clarifiers, chemical treatment plants, rotary distributors, gas holders and many other pieces of equipment are described in a new bulletin just issued by Graver Tank & Mfg. Co., 4809-15 Tod Ave., East Chicago, Ind.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

460. Comminutor. Booklet describes comminutor which acts as sewage screen and cuts up floating solids in the sewage. Design details, tables and blueprints. Chicago Pump Co., 2336 Wolfram St., Chicago, Ill.

461. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York, N. Y.

463. Clarifiers and Digesters. Circular and rectangular clarifiers and dome roof digesters are described in a new catalog. Hardinge Co., Inc., York, Pa.

464. Rotary Distributors. Bulletin describes Infilco rotary distributors and automatic dosing siphons. Infilco, Inc., 325 W. 25th Place, Chicago, Ill.

465. Grit Washers and Collectors, by Jeffrey are built in three types: scraper, V-bucket and combination. For full details ask for Jeffrey Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

466. Flocculation with Floctrols. For details on controlled flocculation, tapered mixing, practical elimination of short circuiting, rapid settling of properly flocculated solds write for Catalog No. 703-A. Jeffrey Mfg. Co., 948-99 No. Fourth St., Columbus, Ohio.

467. Sludge Removers and Mixers. Chain and scraper sludge collectors; Tow-Bro/sludge removers; and Rex Slo-Mixers and flash mixers for multi-stage flocculation. (Just out.) Chain Belt Co., 1679 W. Bruce St., Milwaukee, Wis.

Valves (See Gates, Air Release, etc.)

Waste Elimination

469. Full information on the Pitometer Survey—a complete check-up on your water plant to reveal hidden sources of waste—will be sent promptly by The Pitometer Co., 48 Church St., New York, N. Y.

Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., Inc., 4809—15 Tod Ave., East Chicago, Ind., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

471. Lime specifications and full impartial data on water treatment with lime may be obtained from National Lime Assn., 927 Fifteenth St., N. W., Washington, D. C.

472. Bulletin describes stabilizing lime-softened water by recarbonation, discussing gas production, washing, compressing, drying, and applying the CO(2). Infilco, Inc., 325 West 25th Place, Chicago, Ill.

473. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York, N. Y.

Water Works Operating Practices

490. "Important Factors in Coagulation" is an excellent review with bibliography and outlines of latest work done in the field. Written by Burton W. Graham and sent free on request to Stuart-Brumley Corp., 516 No. Charles St., Baltimore, Md.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.
OF PUBLIC WORKS, published monthly at New York, N. Y., for October 1, 1942.
State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Croxton Morris, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the PUBLIC WORKS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Public Works Journal Corp., 310 East 45h St., New York, N. Y.; editor, A. Prescott Folwell, 310 East 45th St., New York, N. Y.; Managing editor, none; business manager, Croxton Morris, 310 East 45th St., New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Public Works Journal Corp., J. T. Morris, Croxton Morris, A. Prescott Folwell and Anna Morris, all of 310 East 45h St., New York, N. Y., W. A. Hardenbergh, Washington, D. C.; Wesley Hardenbergh, Golf, Ill., and S. N. Hume, address unknown.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) Bertha Morris, White Plains, N. Y., Mary Sunderland, Liberty, N. Y., Estate of Elizabeth Hardenbergh, White Sulphur Springs, N. Y.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is........ (This information is required from daily publications only.)

CROXTON MORRIS, Business Manager.

Sworn to and subscribed before me this 30th day of October, 1942.

CULLEN B. HARDY
Notary Public, Westchester County, N. Y.
Cert. filed in N. Y. Co. No. 876
My commission expires March 30, 1944.

LETTERS
to the Editor

CITY OF LORAIN
ENGINEERING DEPARTMENT
City of Lorain, Ohio

I have noted with much interest the article in October issue entitled "The Operations of Sewage Treatment Plants."

While every issue of PUBLIC WORKS contains interesting articles, I believe that this is the best one since I have been a reader of PUBLIC WORKS, which is several years. It is very complete and is written in such a manner that even an amateur operator can understand it.

Yours truly,
HENRY T. ALEXANDER
City Engineer

Medical Field Service School
Carlisle Barracks
Carlisle, Pennsylvania

I have received your letter of September 2, 1942, together with six copies of the reprint on "Water and Sewage Chemistry and Chemicals." May I express my gratitude for the material which will prove of value to the instructors in Military Sanitation at this School. Your cooperation is indeed indicative of the spirit with which your publication is conducted.

Respectfully yours,
HARRY L. BAKER, JR.
Harry L. Baker, Jr., *Major Sanitary Corps, Assistant to the Director, Department of Military Sanitation.*

J. Frank Roberts Appointed Manager Hydraulic Turbine Dept. Allis-Chalmers, Milwaukee

Retirement of Dr. William Monroe White, internationally known engineer and manager of the hydraulic turbine department of the Allis-Chalmers Mfg. Company, has been announced by Walter Geist, Allis-Chalmers president. J. Frank Roberts, head hydraulic engineer of TVA, succeeds Dr. White as hydraulic department manager, and H. P. Binder has been made manager of the centrifugal pump department.

Roberts, the new department head, came to Allis-Chalmers in 1919, entering the company's graduate engineer training course. He became office manager in the hydraulic department and remained in that capacity until 1927. He then left to join a Canadian utility. In 1938 he joined the Tennessee Valley authority.

Binder, a veteran of 30 years with the company, had been assistant manager of the hydraulic department, in charge of centrifugal pump sales and engineering, since 1940. He joined Allis-Chalmers in 1911, and took charge of the company's first hydraulic test pit a year later. In 1919 he inaugurated sales engineering work in the pump department, where Allis-Chalmers business in this type of equipment has increased greatly.

ADVERTISERS
IN THIS ISSUE